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ABSTRACT

Intended for use by counselors and mathematics teachers, this guide brings together mathematical and occupational skills to form an interrelated curriculum. Eight occupational clusters are included as follow: (1) business and office, (2) communications, (3) construction, (4) hospitality, (5) manufacturing, (6) marketing and distribution, (7) personal service, and (8) transportation. The scope of each cluster is defined, and the major job areas within it are identified in conjunction with suggested vocational courses. A chart then shows the relation of the occupational courses to the mathematical concepts and the mathematical courses in which they are taught. Besides giving the occupational applications of the concept, the chart refers to the appendixes which contain examples of the mathematical problems encountered in the specific occupations. The mathematical skills applied include the following: areas and volumes; computer science; conics; geometry; decimals; basic arithmetic; exponents, roots, and powers; formulas and equations; graphs and tables; logarithms; logic and proof; matrices; measurement systems; parallels and perpendiculars; percents; perspectives and transformations; polynomials; calculus; products and factors; ratio and proportion; statistics and probability; trigonometry; and vector applications. (ELG)

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MATHEMATICS USED IN OCCUPATIONS

An Interrelated Guide

This interrelated curriculum guide was developed under the leadership of the Department of Vocational Technical Education of the Minneapolis Public Schools. The funds for this project were provided through the Education Professions Act Grant.

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Matrix to Occupational Areas:

	Cluster Definition	Mathematical Concepts Found Within Each Occupational Course	Suggested Occ. Course Offering Leading to Occupation
Business and Office	2	5-58	3
Communications	59	63-225	60
Construction	227	229-278	228
Hospitality	280	282-287	281
Manufacturing	289	291-378	290
Marketing and Distribution	380	383-412	381
Personal Services	414	416-423	415
Transportation	424	427-498	426

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THE PURPOSES AND RATIONALE
FOR
MATHEMATICS-OCCUPATIONAL EDUCATION
RELATED CONCEPTS GUIDE

This related concepts guide was developed by mathematics teachers, funded under a grant from the Minnesota State Department of Education, Division of Vocational Education. Its intended use is for all mathematics instructors and counselors.

The purpose of this guide is to:

1. Assist students in making wise choices about mathematics courses in pursuit of their vocational goals and objectives.
2. Help teachers become aware of mathematics concepts needed by students in their identified vocational areas.
3. Provide examples for mathematics instructors in teaching these related concepts.
4. Help facilitate individual student learning.
5. Interrelate the disciplines of mathematics and Occupational Education.

The rationale for the guide is, as you can see, to enable teachers to provide greater opportunity for students to satisfy their particular needs within the framework of the existing mathematics curriculum, not for them to design new mathematics courses.

FOREWORD

This project is a practical approach in weaving together specific skills of two disciplines to form an interrelated curriculum using the "Related Concepts Guide". This method allows students to effect transfer and to apply knowledge learned in one subject matter area to another while at the same time experiencing an accurate, relevant, realistic, and more truly comprehensive picture of an occupation such as those outlined in this document.

Mathematics instructors can use this guide as a vehicle for exercising their responsibility to relate their subject matter to life and to the world of work their students now face or will encounter after leaving school.

Counselors, in addition, can utilize this material as a tool to inform students of the related mathematic skills needed to succeed in life as well as in particular occupations. If used in concert with other guidance and resource material, the counselor could find the job of counseling students much easier; and the counselors' effectiveness could increase to the greater benefit of the students.

Appropriate segments of the guide will also be of use to the vocational teacher to facilitate closer working relationships with other faculty members.

The successful interrelating of disciplines largely depends upon the support and participation of every individual concerned. We invite your support and participation.

A NOTE TO NON-MINNEAPOLIS USERS
OF THIS INTERRELATED GUIDE

This guide was specifically designed to serve the Mathematics needs of students in occupational courses. It can be easily adapted to all school districts or centers with little modification.

Each occupational course in this guide contains representative examples of mathematical concepts needed for a particular occupation.

From this guide, you should:

1. Extract those occupational programs your district offers.
2. Identify the Mathematics courses taught in your district which could provide the mathematical concepts related to the occupation.
3. Use the mathematical appendix examples following each course.
4. Combine occupational courses leading up to a specific occupation/as defined by the chart following each of the eight cluster descriptions.

Instructions for Use of Interrelated Guide

As with any curriculum guide, the effectiveness of this guide depends on the background and resourcefulness of the teacher using it. The guide is not intended to be all-inclusive, and teachers will soon discover a variety of combinations and modifications that will make the guide more useful in their individual situations. Teacher adaptation of the provided material is, in fact, essential whenever a student's occupational goal has been identified, as well as what vocational courses he/she is presently taking.

To use this guide, follow these steps:

1. Turn first to the occupational area, (cluster) e.g. Manufacturing. Each area is alphabetized and color coded.
2. Locate desired vocational course within an occupational area. This is found in the upper left hand corner of the page.
3. Locate mathematical concept to be taught (found in left column of page).
4. When teaching the mathematical concept(s) for each vocational course or occupation, emphasize the occupational application of it and utilize the resource appendix material provided.

Note:

*Due to the overlapping of the mathematical applications, the appendices for the Business & Office and Construction Clusters appear at the end of each cluster.

However, all mathematical applications for the remaining clusters follow the course to which they apply.

(Continued)

Counselors will be most interested in what mathematical concepts are found within an occupation, and what mathematics courses these interrelated concepts are found in, to give guidance to the vocational students in selecting mathematics courses.

Instructors of mathematics will find the material within this interrelated guide to be most pertinent and helpful in their teaching.

OCCUPATIONAL APPLICATION OF MATHEMATICAL CONCEPTS

OCCUPATIONS

MATHEMATICAL SKILLS	BUSINESS & OFFICE							
	Account & Payroll Clerk	Deposit Prep, Credit Trust & Investment Clerk	Office Machine Operator	Keypunch Operator	Automatic Typewriter & Transcription Machine Operator	Clerk Typist & Correspondence Clerk	Stenographer	Administrative Secretary
Areas and Volumes								
Basic Whole Number Skills	●	●	●	●	●	●	●	●
Computers and Calculators	●	●	●	●	●	●	●	●
Conics								
Coordinate Geometry								
Decimals	●	●	●	●	●	●	●	●
Directed Number (+,-), Operations	●	●	●	●	●	●	●	●
Exponents, Powers, Roots								
Formulas and Equations	●		●		●	●	●	●
Fractions	●	●	●		●	●	●	●
Geometric Constructions and Loci								
Geometric Plane Figures								
Geometric Solid Figures								
Graphs and Tables	●	●	●		●	●	●	●
Logarithms								
Logic and Proof	●	●	●					
Matrices	●	●						
Measurement (English & Metric)		●	●	●	●	●	●	●
Parallels and Perpendiculars								
Per Cents	●	●	●	●	●	●	●	●
Perspectives and Transformations								
Polynomials								
Principles of Calculus								
Products and Factors								
Ratio and Proportion	●							●
Rational and Irrational Numbers	●	●	●	●	●	●	●	●
Solving Inequalities								
Special Triangles								
Statistics and Probability	●							●
Trigonometry								
Vector Applications								

MATHEMATICAL SKILLS	COMMUNICATIONS															
	Architectural Drafting	Electrical Drafting	Engineering Drafting	Machine Drafting	Technical Illustrator	Electro-Mechanical Technician	Large Appliance Repair	Small Appliance Repair	Radio Broadcast Trainee	Radio-Sound Equipment Repair	Graphic Arts Trainee	Offset Printer	In-Plant Printer	Silk Screen Printer	Automatic Letterpress Printer	Commercial Photographer
Areas and Volumes	●		●	●	●	●					●	●	●	●	●	●
Basic Whole Number Skills	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Computers and Calculators	●	●	●	●		●		●			●	●			●	●
Conics	●		●	●	●	●	●	●			●	●		●		
Coordinate Geometry	●	●	●	●		●	●	●		●	●	●	●	●	●	●
Decimals	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●
Directed Number (+,-), Operations	●	●	●	●		●			●	●		●	●		●	●
Exponents, Powers, Roots	●	●	●	●		●	●	●	●	●						
Formulas and Equations				●		●	●	●	●	●	●	●	●	●	●	●
Fractions	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●
Geometric Constructions and Loci	●	●	●	●	●						●			●		●
Geometric Plane Figures	●	●	●	●	●					●	●		●	●	●	●
Geometric Solid Figures	●	●	●	●	●					●	●			●		
Graphs and Tables	●	●	●	●		●	●	●	●	●	●	●	●		●	●
Logarithms	●	●	●	●						●	●					
Logic and Proof			●		●	●			●	●	●				●	
Matrices	●	●	●	●	●					●	●					●
Measurement (English & Metric)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Parallels and Perpendiculars	●	●	●	●	●	●			●		●		●	●		●
Per Cents	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Perspectives and Transformations	●	●	●	●	●					●	●		●	●		●
Polynomials			●		●						●					
Principles of Calculus			●		●					●						
Products and Factors	●	●	●	●		●	●	●		●	●		●			
Ratio and Proportion	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Rational and Irrational Numbers	●	●	●	●		●	●	●		●	●	●		●		
Solving Inequalities	●	●	●	●						●	●	●				
Special Triangles	●	●	●	●							●	●	●	●		●
Statistics and Probability			●						●	●	●	●	●			
Trigonometry	●	●	●	●		●	●	●		●	●					
Vector Applications	●	●	●	●	●	●	●	●		●						

MATHEMATICAL SKILLS	CONSTRUCTION						HOSPITALITY	
	Cabinet Maker	Woodworking Machine Operator	Upholsterer Trainee	Building Trades Trainee	Land Surveyor	Painting and Paperhanging Trainee	Quantity Foods Mfg.	Food Preparation & Waiter/Waitress
Areas and Volumes	●	●	●	●	●	●	●	●
Basic Whole Number Skills	●	●	●	●	●	●	●	●
Computers and Calculators	●	●		●	●		●	●
Conics		●	●	●	●	●		
Coordinate Geometry	●	●	●	●	●	●		
Decimals	●	●	●	●	●	●	●	●
Directed Number (+,-), Operations			●	●	●	●		
Exponents, Powers, Roots				●	●			
Formulas and Equations	●	●	●	●	●	●	●	●
Fractions	●	●	●	●	●	●	●	●
Geometric Constructions and Loci				●	●			
Geometric Plane Figures					●			
Geometric Solid Figures					●			
Graphs and Tables	●	●		●	●		●	●
Logarithms					●			
Logic and Proof					●			
Matrices					●		●	●
Measurement (English & Metric)	●	●	●	●	●	●	●	●
Parallels and Perpendiculars	●			●	●	●		
Per Cents	●	●	●	●	●	●	●	●
Perspectives and Transformations					●			
Polynomials					●			
Principles of Calculus					●			
Products and Factors					●			
Ratio and Proportion	●	●	●	●	●	●	●	●
Rational and Irrational Numbers					●			
Solving Inequalities					●			
Special Triangles	●			●	●			●
Statistics and Probability					●		●	●
Trigonometry				●	●			
Vector Applications					●			

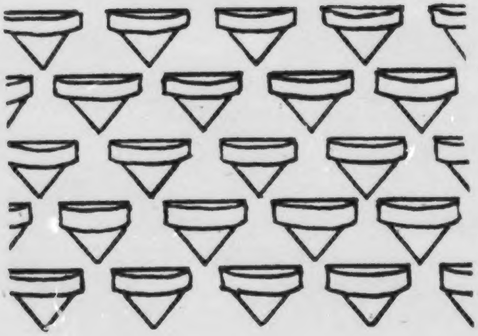
MATHEMATICAL SKILLS	MANUFACTURING						
	Industrial Machine Repair	Jeweler (Manufacturing)	Machinist Trainee	Plastic Machine Operator	Plastic Mold-Maker Trainee	Sheet Metal Worker	Welder
Areas and Volumes		●		●	●	●	
Basic Whole Number Skills	●	●	●	●	●	●	●
Computers and Calculators			●	●	●		
Conics	●	●		●	●	●	●
Coordinate Geometry			●			●	●
Decimals	●	●	●	●	●	●	●
Directed Number (+,-), Operations	●		●	●	●		
Exponents, Powers, Roots			●	●	●		
Formulas and Equations	●	●	●	●	●	●	●
Fractions	●	●	●	●	●	●	●
Geometric Constructions and Loci	●	●	●	●	●	●	●
Geometric Plane Figures			●		●	●	
Geometric Solid Figures							
Graphs and Tables	●		●	●	●	●	●
Logarithms			●		●		
Logic and Proof							
Matrices		●	●		●	●	●
Measurement (English & Metric)	●	●	●	●	●	●	●
Parallels and Perpendiculars						●	●
Per Cents	●	●	●	●	●	●	●
Perspectives and Transformations							
Polynomials							
Principles of Calculus							
Products and Factors							
Ratio and Proportion	●	●	●	●	●	●	●
Rational and Irrational Numbers							
Solving Inequalities							
Special Triangles	●	●	●	●	●	●	●
Statistics and Probability	●	●	●	●	●	●	●
Trigonometry			●	●	●		
Vector Applications							

OCCUPATIONAL APPLICATION OF MATHEMATICAL CONCEPTS

MATHEMATICAL SKILLS	OCCUPATIONS: MARKETING & DISTRIBUTION				PERSONAL SERVICE		TRANSPORTATION				
	Advertising Assistant	Display Trainee	Grocery Store Manager, Cashier, Checker, & Stock Person	Retail Store Manager Trainee	Apparel Arts Specialist	Fashion & Apparel Arts Trainee	Auto Alignment & Brake Specialist	Auto Body Repair	Auto-Lite Truck Mechanic	Auto Tune-Up Specialist	Recreational Vehicle & Small Engine Repair
Areas and Volumes	●	●	●		●	●	●	●	●	●	●
Basic Whole Number Skills	●	●	●	●	●	●	●	●	●	●	●
Computers and Calculators			●	●	●		●		●	●	
Conics											
Coordinate Geometry	●	●					●	●			
Decimals			●	●			●	●	●	●	●
Directed Number (+,-), Operations			●	●	●	●	●	●	●	●	●
Exponents, Powers, Roots											
Formulas and Equations					●			●			
Fractions	●	●	●	●	●	●	●	●	●	●	●
Geometric Constructions and Loci	●	●			●	●	●	●			
Geometric Plane Figures	●	●	●		●	●	●	●			
Geometric Solid Figures	●	●					●	●			●
Graphs and Tables	●	●	●	●	●	●	●	●	●	●	●
Logarithms											
Logic and Proof							●	●	●	●	●
Matrices	●	●		●			●	●	●	●	
Measurement (English & Metric)	●	●	●	●	●	●	●	●	●	●	●
Parallels and Perpendiculars		●			●	●	●	●	●		●
Per Cents	●	●	●	●	●	●	●	●	●	●	●
Perspectives and Transformations											
Polynomials										●	
Principles of Calculus											
Products and Factors								●		●	●
Ratio and Proportion	●	●	●	●	●	●	●	●	●	●	●
Rational and Irrational Numbers	●	●	●	●	●	●	●	●	●	●	●
Solving Inequalities											
Special Triangles	●										
Statistics and Probability	●			●			●	●			●
Trigonometry											
Vector Applications							●				

x

BUSINESS & OFFICE



WHAT IS THE BUSINESS AND OFFICE CLUSTER?

It is the study of the process of converting the spoken and written words into accurate and useful documents. It also includes the use of these documents and the spoken word in communicating with people.

Student activities would include typing business letters, taking and transcribing shorthand, operating a variety of office machines and keeping business records.

Instructional areas would include office skills, data processing, typewriting, shorthand and accounting. Students would also have the opportunity to work in a model office within the school classroom and/or receiving actual on-the-job work experience.

A competent and efficient office staff is essential to the smooth operation of any business or organization.

SUGGESTED COURSE OFFERINGS LEADING TO OCCUPATIONS IN THE BUSINESS AND OFFICE AREA

ACCOUNT CLERK AND PAYROLL CLERK

Suggested Courses:
- Basic Typewriting
- Intermediate Typewriting
- Advanced Typewriting
- Elements of Accounting
- Accounting Procedures
- Accounting Systems
- Office Machines
- Model Office I
- Model Office II
- Model Office III

DEPOSIT PREPARATION CLERK, CREDIT CLERK, TRUST CLERK AND INVESTMENT CLERK

Suggested Courses:
- Elements of Accounting
- Office Systems
- Office Machines
- Banking Preparation I
- Banking Preparation II
- Banking Preparation III
- Basic Typewriting
- Intermediate Typewriting
- Advanced Typewriting

OFFICE MACHINE OPERATOR

Suggested Courses:
- Basic Typewriting
- Intermediate Typewriting
- Advanced Typewriting
- Office Machines Business Recordkeeping Procedures
- Model Office I
- Model Office II
- Model Office III
- Machine Transcription

KEYPUNCH OPERATOR

Suggested Courses:
- Basic Typewriting
- Intermediate Typewriting
- Advanced Typewriting
- Office Machines
- Basic Business Data Processing
- Electronic Data Processing
- Data Processing Applications

BUSINESS AND OFFICE AREA
(Cont)

AUTOMATIC TYPEWRITER OPERATOR AND TRANSCRIPTION MACHINE OPERATOR

Suggested Courses:
- Basic Typewriting
- Intermediate Typewriting
- Advanced Typewriting
- Business Grammar and Punctuation
- Office Machines
- Office Systems
- Applied Office Procedures
- Word Processing
- Machine Transcription

CLERK TYPIST AND CORRESPONDENCE CLERK

Suggested Courses:
- Basic Typewriting
- Intermediate Typewriting
- Advanced Typewriting
- Business Grammar and Punctuation
- Office Machines
- Office Systems
- Applied Office Procedures
- Business Recordkeeping Procedures
- Model Office I
- Model Office II
- Model Office III

STENOGRAPHER

Suggested Courses:
- Basic Typewriting
- Intermediate Typewriting
- Advanced Typewriting
- Shorthand Theory
- Shorthand Dictation
- Shorthand Transcription
- Business Letter Writing
- Office Machines
- Office Systems
- Applied Office Procedures
- Model Office I
- Model Office II
- Model Office III

ADMINISTRATIVE SECRETARY

Suggested Courses:
- Basic Typewriting
- Intermediate Typewriting
- Advanced Typewriting
- Shorthand Theory
- Shorthand Dictation
- Shorthand Transcription
- Advanced Speed Dictation and Transcription
- Office Style Dictation and Office Procedures
- Simulated Shorthand Activities
- Elements of Accounting
- Accounting Procedures
- Accounting Systems
- Office Machines
- Banking Preparation I
- Banking Preparation II
- Banking Preparation III

Cluster Business and Office

Occupation

Guide Accounting (Elements of) #9761

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 5 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Addition and subtraction of mixed decimals	Basic Skills Sr. Math	Prepare a balance sheet - Concept used by accountants - See appendix 5		
Addition property of equality	Elementary Algebra	Indicate the changes in the fundamental elements in the accounting formula which occur as the result of transactions - Concept used by accountants, mathematicians, bookkeepers - See appendix 7	Mathematics Science	
Addition of positive and negative numbers	Elementary Algebra	Compute the balance in an account after transactions - Concept used by accountants, bookkeepers See appendix 7		
Addition and subtraction of mixed decimals	Basic Skills Sr. Math	Construct an income statement - Concept used by accountants, bookkeepers See appendix 8		
Addition and subtraction of mixed decimals	Basic Skills Sr. Math	Construct a trial balance - Concept used by accountants - See appendix 5		

Cluster Business and Office

Occupation ________________

Guide Accounting Procedures #9762

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 6 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Addition of whole numbers and mixed decimals	Basic Skills Sr. Math	Prepare a deposit slip - Concept used by accountants and bookkeepers - See appendix 9		
Addition and subtraction of mixed decimals	Basic Skills Sr. Math	Reconcile a bank statement - Concept used by accountants and bookkeepers - See appendix 10		
Addition and multiplication of whole numbers and mixed decimals; multiplication of fractions and decimals; find % of a number	Basic Skills Sr. Math	Extend prices in a shipping order - Concept used by accountants and clerks See appendix 11		
Add positive and negative numbers	Elementary Algebra	- Determine the new balance of an account - Concept used by accountants - See appendix 7		
Addition and multiplication of whole numbers and mixed decimals; multiplication of fractions and decimals; find % of a number	Basic Skills Sr. Math	Complete a sales slip - Concept used by clerks, bookkeepers, accountants - See appendix 11		
Addition and Subtraction of mixed decimals	Basic Skills Sr. Math	Reconcile a bank statement - Concept used by accountants - See appendix 10		
Addition and subtraction of mixed decimals	Basic Skills Sr. Math	Operate a petty cash system - Concept used by bookkeepers and accountants - [illegible] appendix 12		

Cluster Business and Office

Occupation

Guide Accounting Procedures #9762

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 7 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
ddition and Subtrac- ion of mixed decimals	Basic Skills Sr. Math	Prepare a trial balance - Concept used by accountants and bookkeepers - See appendix 5		
ddition and subtrac- ion of mixed decimals	Basic Skills Sr. Math	Determine profit or loss - Concept used by accountants - See appendix 8		

Cluster Business and Office

Occupation ________________

Guide Accounting Systems #9763

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 8 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Reading a chart or table, find % of a number	Sr. Math	Figure income and social security taxes from a tax table - Concept used by accountants - See appendix 13		
Addition and subtraction of time; multiplication of mixed decimals by mixed decimals	Sr. Math	Figure gross earnings from a time card - Concept used by accountants and payroll clerks - See appendix 14		
Addition of whole numbers and mixed decimals	Basic Skills Sr. Math	Find the sum of amounts of money - Concept used by accountants, bookkeepers, clerks - See appendix 9		
Find a percent of a number	Sr. Math Basic Skills	Figure the interest in a note - Concept used by accountants and bankers See appendix 15		
Find a percent of a number	Sr. Math Basic Skills	Figure the net proceeds from a discounted note - Concept used by accountants and bankers See appendix 15		
Addition and division of whole numbers and mixed decimals	Sr. Math Basic Skills	Compute depreciation per year - Concept used by accountants - See appendix 16		
Find a percent of a number	Basic Skills Sr. Math	Determine amount of bad debts expense - Concept used by accountants - See appendix 15		
Addition and subtraction of mixed decimals	Basic Skills Sr. Math	Totaling of cash paid in account and posting to indiv. accounts - Concept used by accountants - See appendix 9 and appendix 7		

Cluster Business and Office

Occupation ________________

Guide Accounting Systems #9763

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 9 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Addition and subtraction of mixed decimals	Basic Skills Sr. Math	Handling of petty cash - Concept used by accountants and bookkeepers - See appendix 12		

Cluster Business and Office

Occupation ____________

Guide Business Recordkeeping Procedures #9769

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 10 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Making change	Basic Skills	Make change correctly - Concept used by cashiers and clerks - See appendix 17		
Addition of whole numbers and mixed decimals	Basic Skills Sr. Math	Prepare a cash-drawer count and proof of cash form - Concept used by cashiers and clerks - See appendix 9	Accounting	
Addition of whole numbers and mixed decimals	Basic skills Sr. Math	Prepare deposit slips - Concept used by accountants & bookkeepers - See appendix 9	Accounting	
Addition and subtraction of mixed decimals	Basic Skills Sr. Math	Reconcile a bank statement - Concept used by accountants and bookkeepers - See appendix 10	Accounting	
Addition and subtraction of mixed decimals	Basic Skills Sr. Math	Operate a petty cash fund - Concept used by accountants and bookkeepers - See appendix 12	Accounting	
Addition and multiplication of whole numbers and mixed decimals; multiplication of fractions and decimals; find % of a number	Basic Skills Sr. Math	Fill out a sales slip and compute sales tax - Concept used by clerks, bookkeepers, accountants - See appendix 11		
Addition of whole numbers and mixed decimals	Basic Skills Sr. Math	Prepare a customer statement of account - Concept used by clerks, bookkeepers, accountants - See appendix 9		

Cluster Business and Office

Occupation

Guide Dictation & Transcription (Advanced) #9756

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 11 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Multiplication and division of whole numbers	Basic Skills Sr. Math	Write fluently from practice dictation at 80 words per minute - Concept used by stenographers - See appendix 3		
Find a % of a number; find what % one number is of another	Basic Skills Sr. Math	Transcribe notes on a typewriter with 95% accuracy - Concept used by stenographers and typists - See appendix 29		
Multiplication and Division of whole numbers	Basic Skills Sr. Math	Transcribe 3-5 letters in 30 minutes - Concept used by typists and stenographers - See appendix 3		

*Note: These math concepts are utilized in determining the competencies of students wanting to enter an office position.

Cluster Business and Office

Occupation

Guide Electronic Data Processing #9959

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 12 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Place value division of whole numbers	none	Write a variety of decimal digits and numbers in binary - Concept used by computer scientist and beginning programmers - See appendix 28		Concept of place value taught in Basic Skills; changing to binary taught in Jr. high
Add, sub, mult mixed decimals; find % of a number; find what % one number is of another	Basic Skills Sr. Math	Solve a problems through the use of Basic programming - Concept used by programmers - See appendixes 5,7,8,9,11,12,14,15,19,20, 21,22,25		

Note: While straightforward, specific examples of applications of mathematical concepts are not found explicitly in this guide, it is apparent that the kind of logic used in programming Basic and other languages is similar to the kind of logic used in mathematics, especially in Algebra and higher level mathematics courses, the concept of a number being represented by a variable is fundamental in algebra as it is in computer programming. However, it is not possible to specifically state that one or two isolated mathematical skills are applied to a specific programming skill. It seems that a whole "way of thinking" that emerges and takes shape while a student progresses satisfactorily through algebra and higher math courses prepares the student to be at ease with the same "ways of thinking" when studying programming. In addition, many of the examples used in programming are chosen from arithmetic because they are easily programmed and the results are easily verifiable. The conclusion must be, then, that all of arithmetic and algebra have application in the course.

Cluster Business & Office

Occupation

Guide Model Office I #9774

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 13 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Use of calculators (10 key, full key, electronic, use of memory, percent, constant)	Business math (some understanding in general math)	Used in bookkeeping, writing receipts, record-keeping, cashiering, statistical reports See Appendix 30	Cashiering Sales skills	
Estimating	Basic math	Mental check to see if answers obtained are reasonable		
Percent	Basic math Business math	Bookkeeping, sales tax, interest		
Add, subtract whole, decimals	Basic math Bookkeeping (not a math department course)	Bookkeeping, accounts payable and accounts receivable See Appendix 31		
Payroll procedures (add, subtract, multiply, divide, figure overtime, use tax tables)	Basic math Business math	Keep a payroll record, make payroll checks, fill out tax forms, time cards See Appendix 32,33,34		
Read a scale		Use postage meter See Appendix 35	Science Chemistry	

Cluster Business and Office

Occupation

Guide Model Office II #9775

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 14 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Addition and subtraction of time; multiplication of mixed decimals	Basic Skills Sr. Math	Compute hours worked, gross pay, deductions, and net pay - Concept used by payroll dept. employers See appendixes 13 and 14		
Read a chart; multiply fractions and decimals	Basic Skills Sr. Math	Determine correct postage according to weight - Concept used by mail clerk - See appendix 23		
Addition and subtraction of mixed decimals	Basic Skills Sr. Math	Gather and consolidate statistical information from source documents - Concept used by statistical clerk - See appendixes 5 and 8		
Addition and multiplication of mixed decimals and fractions; find a % of a number	Basic Skills Sr. Math	Type from unarranged material an invoice in correct format - Concept used by typists and billing clerks - See appendix 11		

Cluster Business and Office

Occupation ________________

Guide Model Office III #9776

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 15 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Addition and subtraction of time; multiplication of mixed decimals	Basic Skills Sr. Math	Computer hours worked, gross pay, deductions, and net pay - Concept used by payroll dept. employees See appendixes 13 and 14		
Addition of whole numbers and mixed decimals	Basic Skills Sr. Math	Prepare deposit slip - Concept used by clerks, accountants, & bookkeepers - See appendix 9		
Addition and multiplication of mixed decimals and fractions; find a % of a number	Basic Skills Sr. Math	Calculate and verify all figures on sales slips - Concept used by sales clerk - See appendix 11		
Addition of whole numbers & mixed decimals	Basic Skills Sr. Math	Prepare weekly sales summary based on customer purchases - Concept used by sales clerk - See appendix 9		
Addition and subtraction of mixed decimals	Basic Skills Sr. Math	Maintain and accurate inventory of supplies - Concept used by inventory control clerk See appendix 7		
Addition and multiplication of mixed decimals and fractions; find a % of a number	Basic Skills Sr. Math	Prepare a purchase requisition - Concept used by purchasing agent and inventory controls clerk - See appendix 11		
Addition of whole numbers and mixed decimals	Basic Skills Sr. Math	Prepare weekly purchases summary - Concept used by purchasing agent & clerks - See appendix 9		

Cluster Business and Office

Occupation

Guide Model Office III #9776

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 16 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Read a chart; multiply fractions and decimals	Basic Skills Sr. Math	Determine correct postage according to weight - Concept used by mail clerk - See appendix 23		
Addition and subtraction of mixed decimals	Basic Skills Sr. Math	Gather and consolidate statistical information from source documents - Concept used by statistical clerk - See appendixes 5 and 8		
Addition and multiplication of mixed decimals and fractions; find a % of a number	Basic Skills Sr. Math	Type from unarranged material an invoice in correct format - Concept used by typists and billing clerks - See appendix 11		

Cluster Business and Office

Occupation

Guide Office Dictation Procedures #9757

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 17 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Multiplication and division of whole numbers	Basic Skills Sr. Math	Take practice material at 80 words per minute - Concept used by stenographers - See appendix 3		
Multiplication and division of whole numbers	Basic Skills Sr. Math	Transcribe notes on typewriter at 15-25 wpm transcribe mailable letters at 15-25 wpm - Concept used by typists and stenographers - See appendix 3		

*Note: These math concepts are utilized in determining the competencies of students wanting to enter an office position.

Cluster Business and Office

Occupation

Guide Office Machines #9766

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 18 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Add, subtract, multiply, divide whole numbers, fractions, decimals	Basic Skills Sr. Math all others	Review addition, subtraction, multiplication and division of whole numbers, fractions, and decimals. See any fundamental math series		No examples are included because this is treated as a review of skills rather than as an application in this guide
Fractions, decimals, %, equivalents, multiplications of decimals	Basic Math Sr. Math	Change fractions and percentages to decimals to solve problems - Concept used by most office workers - See appendix 18		
Addition, subtraction, multiplication, and division of mixed decimals; find a % of a number; find what % one number is of another; addition and subtraction of time	Basic Skills Sr. Math	Solve interest, mark up, markdown, discount, payroll, pro-rating, and averaging problems - Concept used by most office workers - See appendixes 15,14,16,19,20		
Negative numbers; addition and subtraction of positive and negative numbers	Elementary Algebra	Work problems (on adding machines) with credit balances - Concept used by clerks, bookkeepers, accountants - See appendix 7		

Cluster Business and Office

Occupation ________________

Guide Office Procedures (Applied) #9768

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 19 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Subtract, divide whole numbers, use of ruler	Basic Skills Sr. Math	Center horizontally and vertically - Concept used by typists - See Appendixes 2 and 4		
Addition and multiplication of mixed decimals; find a % of a number	Basic Skills Sr. Math	Prepare an invoice and verify calculations on invoice - Concept used by clerks - See appendix 11		
Addition of positive & negative numbers or Addition & subtraction of mixed decimals	Elementary Algebra Basic skills Sr. Math	Prepare a monthly statement - Concept used by accountants and bookkeepers - See appendix 7		
Addition and multiplication of mixed decimals and fractions; find a percent of a number	Basic Skills Sr. Math	Prepare a purchase requisition - Concept used by purchasing agent, clerks See appendix 11		
Find a % of a number, subtract mixed decimals	Basic Skills Sr. Math	Compute cash discount on purchases - Concept used by bookkeepers, clerks - See appendix 20		
* Addition and subtraction of time. Multiplication of mixed decimals; read a chart; take a % of a number	Basic Skills Sr. Math	* Compute regular and overtime hours; determine gross and net pay - Concept used by payroll clerk - See Appendixes 13 and 14		

Cluster Business and Office

Occupation

Guide Office Procedures (Applied) #9768

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 20 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Addition of mixed decimals	Basic Skills Sr. Math	Disburse cash payroll - Concept used by payroll clerk - See appendix 27		
Addition of mixed decimals subtraction of mixed decimals	Basic Skills Sr. Math	Prove cash and prepare a deposit ticket - Concept used by clerks, cashiers, and bookkeepers - See appendix 9		
Addition and subtraction of mixed decimals	Basic Skills Sr. Math	Reconcile the bank statement - Concept used by clerks, cashiers, and bookkeepers - See appendix 10		
* Addition and multiplication of mixed decimals and fractions; find a percent of a number	Basic Skills Sr. Math	* Check and verify suppliers invoice - Concept used by purchasing agent and clerks - See appendix 11		

Cluster Business and Office

Occupation ________________

Guide Office Systems #9767

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 21 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Addition, subtraction, multiplication, & division of whole numbers	Basic Skills Sr. Math	Review addition, subtraction, multiplication and division of whole numbers - Concept used by everyone - See any fundamental math series or text		No examples are included because these topics are treated as a review of skills rather than as applications in this guide
Convert fractions to decimals	Basic skills Sr. Math	Convert fractions to decimals (this is a basic skill and is found in any fundamental math text)		
Multiply and divide by fractions and decimals	Basic Skills Sr. Math	Multiply and divide by fractions and decimals (this is a basic skill and is found in any fundamental math text)		
Find what percent one number is of another	Basic Skills Sr. Math	Figure percentage of increase and decrease - Concept used by accountants, bookkeepers, office workers - See appendixes 19, 20,21		
Find percent of a number. Find what percent one number is of another	Basic Skills Sr. Math	Figure interest income and interest charges - Concept used by accountants, bookkeepers See appendixes 15 and 22		
Addition and multiplication of mixed decimals, multiplication of fractions and decimals, find % of a number	Basic Skills Sr. Math	Type invoices when merchandise is shipped using correct prices - Concept used by typists, bookkeepers, clerks - See appendix 11		
Reading a chart; multiplying fractions and decimals	Basic Skills Sr. Math	Figure the cost of sending letters and packages - Concept used by mail clerks - See appendix 23		

Cluster Business and Office

Occupation

Guide Office Systems #9767

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 22 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Reading a chart; multiplying fractions and decimals	Basic Skills Sr. Math	Figure the cost of sending packages via various carriers - Concept used by shipping clerk - See appendix 24		
Find a percent of a number	Basic Skills Sr. Math	Compute discounts and chain discounts - Concept used by accountants, bookkeepers, clerks - See Appendixes 20,25		
Add and subtract mixed decimals	Basic Skills Sr. Math	Keep an account of checks written and deposits made - Concept used by accountants and bookkeepers - See appendix 26		
Add and subtract whole numbers and mixed decimals	Basic Skills Sr. Math	Prepare bank deposit - Concept used by accountants, bookkeepers, clerks - See appendix 9		
Add and subtract mixed decimals	Basic Skills Sr. Math	Reconcile bank statement - Concept used by accountants, bookkeepers - See appendix 10		
Add and subtract mixed decimals	Basic Skills Sr. Math	Operate petty cash fund - Concept used by accountants and bookkeepers - See appendix 12		
Add and subtract units of time multiply mixed decimals	Basic Skills Sr. Math	Figure hours worked and gross earnings - Concept used by accountants, bookkeepers, payroll clerks - See appendix 14		

Cluster Business and Office

Occupation

Guide Office Systems #9767

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 23 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Read a chart; take a % of a number	Basic Skills Sr. Math	Figure deductions for withholding taxes and social security - Concept used by accountants, bookkeepers and payroll clerks - See appendix 13		

Cluster Business and Office

Occupation

Guide Shorthand Activities (Simulated) #9758

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 24 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Multiplication and division of whole numbers	Basic Skills Sr. Math	Take practice material at 90 wpm - Concept used by typists and stenographers - See appendix 3		
Multiplication and division of whole numbers	Basic Skills Sr. Math	Transcribe notes on typewriter at 20-35 wpm - Concept used by typists and stenographers - See appendix 3		

*Note: These math concepts are utilized in determining the competencies of students wanting to enter an office position.

Cluster Business and Office

Occupation

Guide Shorthand Dictation #9754

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 25 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Multiply, divide whole numbers	Basic Skills Sr. Math	Improve typing speed - Concept used by typists - See appendix 3		

*Note: These math concepts are utilized in determining the competencies of students wanting to enter an office position.

Cluster Business and Office

Occupation ________________

Guide Shorthand Transcription #9755

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 26 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Multiplication and division of whole numbers	Basic Skills Sr. Math	Compute rate of dictation - Concept used by stenographer - See appendix 3		
Multiplication and division of whole numbers	Basic Skills Sr. Math	Transcribe 3-5 short-medium letters within 30 minutes - Concept used by typists and stenographers - See Appendix 3		
Find a % of a number; find what % one number is of another	Basic Skills Sr. Math	Transcribe shorthand notes with 95% accuracy - Concept used by stenographers - See appendix 29		

*Note: These math concepts are utilized in determining the competencies of students wanting to enter an office position.

Cluster Business and Office

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

Sht 27 of

Occupation

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Guide Typewriting (Advanced) #9752

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Multiplication and division of whole numbers	Basic Skills Sr. Math	Compute typing speed - Concept used by typists - See appendix 3	Word Processing	

*Note: These math concepts are utilized in determing the competencies of students wanting to enter an office position.

Cluster Business and Office

Occupation

Guide Typewriting (Applied) #9950

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 28 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Multiplication and division of whole numbers	Basic Skills Sr. Math	Compute typing speed - Concept used by typists - See Appendix 3	Word Processing	
Subtraction and Division of whole numbers	Basic Skills Sr. Math	Center typed material on page, both horizontally and vertically - Concept used by typists - See appendix 2	Word Processing	

*Note: These math concepts are utilized in determining the competencies of students wanting to enter an office position.

Cluster Business and Office

Occupation

Guide Typewriting (Basic) #8081

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 29 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Multiplication and division of whole numbers	Basic Skills Sr. Math	Compute typing speed - Concept used by typists - See appendix 3	Word Processing	
Subtraction and Division of whole numbers	Basic Skills Sr. Math	Center typed material on a page, both horizontally and vertically - Concept used by typists - See appendix 2	Word Processing	
Use of a ruler	Basic Skills	Measure margins, measure length of typed copy - Concept used by typists - See appendix 4		

*Note: These math concepts are utilized in determining the competencies of students wanting to enter an office position.

Cluster Business and Office

Occupation

Guide Typewriting (Intermediate)
#9571

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 30 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Multiplication and division of whole numbers	Basic Skills Sr. Math	Compute typing speed - Concept used by typists - See appendix 3	Word Processing	
Subtraction and division of whole numbers	Basic Skills Sr. Math	Center typed material on page, both horizontally and vertically - Concept used by typists - See appendix 2	Word Processing	

*Note: These math concepts are utilized in determining the competencies of students wanting to enter an office position.

Cluster Business and Office

Occupation

Guide Word Processing #9777

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 31 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Addition and division of whole numbers	Basic Skills Sr. Math	Determine the number of lines in a letter and the length of typed material - Concept used by typists - See Appendix 1	Typing	
Subtraction and Division of whole numbers	Basic Skills	Set proper margins - Concept used by typists - See appendix 2	Typing	
Multiplication and division of whole numbers	Basic Skills Sr. Math	Compute typing speed, work speed - Concept used by typists - See appendix 3	Typing	
Use of a ruler	Basic Skills	Measure margins, measure length of typed copy - Concept used by typists - See appendix 4	Typing	

Appendix 1

Example 1 If a certain piece of material contains 500 words and if an average of 13 words can be typed on a line, how many lines will be required to type the material?

Example 2 In a certain letter, there are five paragraphs consisting of eight lines, twelve lines, nine lines, seventeen lines, and four lines. If one line is skipped between each paragraph, how many lines are required to type the letter?

Example 3 In the above problem, if six lines require 1", how many inches long will the letter be?

Appendix 2

Example 1 Suppose that on an 8½" x 11" typed page, there is to be a 2" margin at the top and 1" at the bottom. How many lines can be typed on the page if each inch contains six lines of typing?

Example 2 Suppose that six lines of typing requires 1" on the paper. If 42 lines are to be centered on an 8½" x 11" page, how large should the margins be at the top and at the bottom of the page?

Example 3 If each line of typing is 7½ inches long, how wide should the margins be if the typed material is to be centered on an 8½" x 11" sheet?

Appendix 3

Example 1 What is the typing speed for a person that types 310 words in 5 minutes?

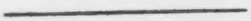
Example 2 If a typist must process 20 letters in four hours, what is the average amount of time that can be spent on each?

Example 3 If a person dictates 370 words in 5 minutes, what is the rate per minute?

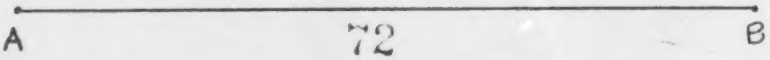
Example 4 If a secretary takes shorthand at the rate of 85 words per minute, how many words will be written in 5 minutes?

Appendix 4

Example 1 Measure the length of this segment to the nearest 1/16":



Example 2 On segment AB, mark a point 3/4" to the right of point A and another point 3/4" to the left of point B.



Appendix 5

Example 1 Find the total of these assets: cash, $2,894.25; accounts receivable, $1,250.75; repair parts, $3,800.00; land $1,500.00.

Example 2 Find the total of the following liabilities and owners equity: accounts payable, $1,100.00; capital stock, $12,000.00; earned surplus, $3,145.00.

Example 3 If the assets of a firm are $8,179.50; and the liabilities are $3,256.75, find the owners equity. (assets minus liabilities equals owner's equity)

Appendix 6

Example 1 In the equation A = L + 0, if $500 is added to L, if 0 does not change, what change must occur in A?

Example 2 In the equation A = L + 0, if A is decreased by $1200 and 0 is increased by $300, what change occurs in L?

Appendix 7

Example 1 A certain company receives these amounts of cash during a week: $1,226.75; $872,50; $685.25; $1,371.60; and $1,173.20. During the same week, it pays out $873.20; $1,571.30; $326.40; and $760.80. How much cash does it have left at the end of the week?

Example 2 If the amounts $6300, $1800, and $2500 were put into an account and $8700, $10,300, $5100, and $1200 were taken out of an account, what number will represent the balance of the account?

Example 3 If the total of $38.21, $89.92, $13.59, $163.12, and $41.00 is subtracted from the total of $100.00, $75.29, and $63.72, what number represents the result?

Appendix 8

Example 1 If net income equals total income minus expenses, find the net income from the following information:

amounts of income: $3,754.00; $2,643.00; 873.00;
$37.42; $500.00; $1,373.26
expenses: $2,000.00; $878.75; $1,365.20

Example 2 For a certain year, the total income of a company was $53,862.13. If the total expenses were $56,261.20, did the company make a profit or suffer a loss? What was the amount of the profit or loss?

Appendix 9

Example 1 A bank deposit consisted of the following:

currency - \$83.72

coin - \$8.79

Checks - \$25.00, \$31.23, \$44.73, \$121.89, \$50.00, \$13.99,
\$45.13

What was the total amount of money deposited?

Example 2 Find the sum of these amounts:

\$2,005.00; \$500.00; \$735.00; \$3,800.00; \$120.00; \$1,000.00;
\$2,400.00; \$80.00; \$1,150.00; \$250.00

Appendix 10

Example 1 Add $1,151.26, $342.70, and $250.00. From this result, subtract the total of: $5.00, $17.00, $14.52, $153.20, and $20.00

Example 2 Finish reconciling the following bank statement:

Balance shown in		Balance shown in	
bank statement:	$1082.73	check book:	$1157.75
add: deposits		add deposits not	
not statement:	132.60	in checkbook:	- 0 -
Total:	________	Total:	________
Subtract: checks issued		Subtract:	
but not in statement:		Service charges $.89	
No. 668	$11.54	Total	________
672	10.73		
673	1.25		
674	34.95		
Total	________		
Balance:	________	Balance:	________

Appendix 11

Example 1 An order consists of 3 tables @ $115.50 ea.; 12 chairs @ $31.20 ea.; and 6 lamps @ $23.70 ea. Find the total cost of the tables, the total for the chairs, and the total for the lamps. Then find the total cost of the order. Find the sales tax (4% of the total order). What is the total amount which is to be paid for this order?

Example 2 Find the total cost (including 4% sales tax) for the following order:

6 cases of canned corn	$5.50 per case
3 sacks of potatoes	8.50 per sack
1/2 bu. of apples	6.95 per bu.
60 dz. eggs	.62 per dozen

Example 3 Make out an invoice for the following order:

96 gal. #B2111, white enamel @ 5.65 per gallon
6 qt. #B2124, spray blue enamel @ 2.90 per qt.
12 qt. #B2125, french gray enamel @ 1.90 per qt.
Be sure to add in 4% sales tax.

Appendix 12

Example 1 A petty cash fund was started in an office with $50.00 in it. During January, the following occurred:

These amounts were spent: $1.75, $5.50, $12.25, $.50, $2.25, $8.00, $6.25

Then $25.00 was added to the account, followed by expenditures of $2.50, $9.00, $3.75, and $4.25. How much was in the account at the end of January?

Appendix 13

Gross earnings for 2 weeks	% of earnings to be withheld for each number of dependents						
	0	1	2	3	4	5	6
$ 0- 49.99	4	2	0	0	0	0	0
50 74.99	5	3	1	0	0	0	0
75- 99.99	6	4	2	1	0	0	0
100-124.99	7	6	5	3	1	0	0
125-149.99	9	7	6	4	3	1	0
150-174.99	10	8	7	5	4	2	1
175-200	12	10	9	8	6	5	3

Example 1 Find the amount to be withheld from a worker who earns $113.00 and reports two dependents. Use the table above.

Appendix 14 The rate of pay for a job is: #3.60 per hour; time and one half for all hours over 8; time and one-half for all hours on Sat.: double time for all hours on Sunday. If the worker puts in more than 4 hrs. per day, he or she is not paid for 1/2 hour for lunch.

Example 1 Find the total earnings if the time card shows:

Mon.	8:00 - 4:30
Tues.	8:00 - 5:30
Wed.	10:00 - 4:30
Thurs.	8:00 - 4:30
Fri.	8:00 - 5:30

Example 2

Mon.	8:00 - 4:30
Tues.	8:00 - 4:30
Wed.	8:00 - 4:30
Thurs.	8:00 - 4:30
Fri.	8:00 - 4:30
Sat.	8:00 - 12:00
Sun.	8:00 - 12:00

Example 3

Mon.	8:00 - 6:00
Tues.	8:00 - 6:00
Wed.	8:00 - 4:30
Thurs.	8:00 - 6:30
Fri.	8:00 - 5:30
Sat.	8:00 - 4:30

Appendix 15

Example 1 Find the interest on a $1,000 note at 6% for 60 days.

Example 2 Find the net proceeds from a $5,000, 90 day note at 3% interest.

Example 3 A company had sales for the year of $94,200. If ½ of 1% of this amount will be uncollectable, how much money will be uncollectable?

Example 4 Find the interest on $638.50 at 8% for two years six months.

Appendix 16

Example 1 If a truck cost $7,000 and was expected to last five years, what is the average cost per year?

Example 2 If the monthly wages of each of the six employees of the Alaska Ice Cube Company are $210, $240, $175, $360, $290, and $1575, what is the average monthly wage paid by this company?

Appendix 17

Example 1 A clerk sells the following items:

Shirt: $6.95

Pants: $15.00

Coat: $34.95

How much change should the customer receive from $60.00?

Example 2 If a customer's bill is $6.13 and is paid with a $10 bill, now many pennies, nickels, dimes, quarters, and dollars should the cashier give in change?

Appendix 18

Example 1	Change 2/5 to a decimal. Then find 2/5 of $81.63.
Example 2	Find 12 1/2% of $138.
Example 3	Change 60% to a decimal. Then find 60% of $12,141.00.

Appendix 19

Example 1 A snowmobile is bought for $1500. What will be the selling price if the mark up is to be 40%?

Example 2 A coat that cost $20 is sold for $28. What is the percent of mark up?

Example 3 An item that sells for $140 has been marked up 30%. What did it cost?

Appendix 20

Example 1 At the end of the summer, bathing suits are marked down 40%. If a suit originally sold for $12.95, what does it cost at the end of the summer?

Example 2 For a special sale, a water heater that normally sells for $120 is on sale for $80. What is the percent of markdown?

Example 3 The employees of Gismo's Department Store are allowed a 12% discount on all their purchases. What would it cost an employee to purchase a refrigerator that sells for $319.00?

Example 4 If Loser Auto Parts sells $50 tires for $36, what % of discount is being allowed?

Appendix 21

Example 1 In October, eggs sold for 80¢ a dozen. In December, they were selling for 60¢ a dozen. What was the percent of decrease?

Example 2 The Hang-out Drive In made a profit of $15,000 last year and $16,750 this year. What was the percent of increase?

Example 3 Complete filling out the following table:

Model	Sales		Increase		Decrease	
	Last year	This year	Amount	%	Amount	%
A	1276	1595	319	25.0		
E	3458	3254			204	5.9
K	2189	2298	109	5.0		
N	4369	4450				
O	145	223				
R	217	315				
S	9876	6759				
U	1560	2130				

Appendix 22

Example 1 The interest charge on a $500 note was $20 for six months. What was the annual interest rate on this note?

Example 2 A typewriter that sells for $245.00 requires a down payment of $15.00 and 18 monthly payments of $14.50 each. Another typewriter, selling for $255.00, requires a $15.00 down payment and 24 monthly payments of $12.50 each. Find the rate of interest charged for each typewriter.

Appendix 23

First Class Mail		2nd Class Mail	3rd Class Mail
First class mail post cards - Business Reply mail	10¢ per ounce 8¢ per ounce 10¢ per ounce plus 2¢ per piece	(newspapers and periodicals) 8¢ for 1st 2 ounces 2¢ for each additional ounce	books and printed matter, less than 16 oz. 10¢ first 2 ounces 3¢ each additional ounce

Example 1 Using the above table, find the cost of mailing a first class letter weighing 1½ ounces.

Example 2 Use the table above to find the cost of mailing a book weighing 7 ounces sent first class.

Example 3 Use the table above to find the cost of mailing a newspaper weighing 5½ ounces.

Example 4 A contract is sealed in a large manilla envelope, total weight 12 3/4 ounces, and is sent first class. Use the table above to find the cost.

Appendix 24

Parcel Post Rates

pounds	local	up to 150 mi	150-300 mi
2	$.40	$.50	$.50
3	.40	.55	.60
4	.45	.60	.65
5	.45	.65	.70

Air Parcel Post Rates

pounds	up to 300 mi
2	$1.16
3	1.64
4	2.12
5	2.60

REA Rates

pounds	up to 100 mi	100-200 mi	200-300 mi
5	$3.15	$3.15	$3.15
10	3.15	3.20	3.30

Example 1 Using the charts above, what would REA charge for a 7 lb package which was shipped 175 miles?

Example 2 Find the cost of shipping a 3¼ lb. package a distance of 225 miles by Parcel Post. Use the charts above.

Appendix 24

Example 3 Find the cost of shipping 4½ package 220 miles and a 1 lb. package 140 miles by Air Parcel Post. Use the charts above.

Example 4 A 5 lb. package is to be shipped 275 miles. Use the charts above to determine the least expensive method of shipping it. What would the cost be?

Appendix 25

Example 1 Five items were sold at $69.50 each. A 35% discount was allowed. What was the net price?

Example 2 An item selling for $66.00 has discounts of 33 1/3% and 20% applied. What is the net price?

Example 3 Six place settings of silverware were billed at $28.75 each. Discounts of 25% and 20% were allowed. Find the net price after discount.

Appendix 26

Example 1 Beginning with a balance of $239.78, prepare checkbook stubs for these deposits and checks:

a. Deposit $50; check $32.75

b. Check $15.86

c. Check $55.35

d. Deposit $125; check $8.98

e. Check $26.84

f. Deposit $15.25: check $6.95

g. Check $3.39

h. Check $10.95

Appendix 27 Eight workers are to be paid the amounts shown. Make a chart of how many of each denomination of money each one should get. Find the total of each denomination that will be needed to pay these workers.

Worker	Amount	$10 bills	$5 bills	$1 bills	25¢	10¢	5¢
A	$97.^{\underline{00}}$						
B	$93.^{\underline{00}}$						
C	9.65						
D	43.45						
E	61.70						
F	87.15						
G	7.85						
H	58.25						
	Totals:						

Appendix 28

Example 1 In the number 6,387, the 3 is in the _________ place and the 7 is in the _________ place.

Example 2 27,461 = (2 x 10,000) + (7 x _____) + (_____ x 100) + (_____ x _____) + 1

Example 3 In the diagram at the right, draw a loop around 32 x's. Then loop 16 x's if possible. Then loop 8, 4, 2, and 1 if possible.

x x x x x x x x
x x x x x x x x
x x x x x x x x
x x x x x x x x
x x x x x x x x
x x x x x x x x
x x x x x x x x

Example 4 Write 81 in binary rotation

Example 5 Write 1101110_{two} in decimal notation.

Appendix 29

Example 1 If 500 words have been dictated and accuracy must be 95%, how many must be transcribed correctly?

Example 2 A typist made six errors in transcribing 150 words. Is this within 95% accuracy?

Example 3 A typist made seven errors in transcribing 300 words. What percent accuracy is this?

Example 4 A typist correctly transcribed 875 words out of 900 dictated. What percent accuracy is this?

Appendix 30

Complete the balance sheet for Willard Company.

WILLARD COMPANY
BALANCE SHEET, JULY 31, 197_

ASSETS		
Cash	$5,000.00	
Notes Receivable	3,000.00	
Customer's Accounts Receivable	11,280.00	
Equipment	7,500.00	
Supplies	830.00	
Total Assets		
LIABILITIES		
Accounts Payable	$4,400.00	
Notes Payable	1,000.00	
Taxes Payable	540.00	
Total Liabilities		
Net Worth July 31, 197_		

($27,610.00; $5,940.00; $21,670.00)

Appendix 31

On 7/15, Howard B. Roberts buys merchandise worth $45.00 plus $1.35 tax. He charges the purchase. Enter this properly in the ledger as line 7. On 7/16 Howard B. Roberts makes a payment of $20.00 on his account. Make the suitable entry at line 8.

	CASH		CHECK NO.	DATE	ACCOUNT TITLE	POST REF.			ACCOUNTS PAYABLE	
	DEBIT	CREDIT					DEBIT	CREDIT	DEBIT	CREDIT
7.				7/15	Howard B Roberts					
8.	20.00			7/16	Howard B. Roberts	✓				
9.				7/16	Moore Co.	✓				300.00
10.										
11.										

	ACCOUNTS RECEIVABLE		PURCHASE DEBIT	SALES CREDIT	SALES TAX PAYABLE
	DEBIT	CREDIT			
7.	46.35			45.00	1.35
8.		20.00			
9.			300.00		
10.					
11.					

On 7/16 merchandise was purchased from Moore Company for $300.00. Enter the transaction on line 9.

Appendix 32

Complete the partial payroll register:

EMPLOYEE	M	T	W	TH	F	S	REG. HRS.	REG. RATE	AMT.	OVER HRS.	OVER RATE	AMT.	TOTAL
BRENNAN, T.	8	7	8	6	8	0	____	1.65	___	___	____	____	___
CARTER, T.	8	9	8	10	6	3½	____	1.72	___	___	____	____	___

(37; $61.05;--;--;--; $61.05; 40; $68.80; 4½; 2.58; 11.61; 80.41)

Appendix 33

Using the F.I.C.A. and Withholding Tables compute the payroll register:

EMPLOYEE	EXEMPTIONS	M	T	W	TH	F	S	REG. HRS.	REG. RATE	AMOUNT	OVERTIME HRS.
HAMP, C.	3	8	8	6	8	7	0	____	$1.68	____	____
PORT, S.	41	8	8	8½	8	8	8	____	$2.06	____	____

OVERTIME RATE	AMOUNT	GROSS SALARY	DEDUCTIONS				NET SALARY
			SOC. SEC.	IN. TAX	OTHERS	TOTAL	
1.					$1.87		
2.					$2.04		

(1. 37; $62.16; $62.16; $2.25; $4.40; $8.52; $53.64)
(2. 40; $82.40; 8½; 3.09; 26.27; 108.67; 3.94; 10.10; 16.08; 92.59)

Appendix 33

INCOME TAX WITHHOLDING TABLE

If the payroll period with respect to an employee is **weekly:**

And the wages are—		And the number of withholding exemptions claimed is—										
At least	But less than	0	1	2	3	4	5	6	7	8	9	10 or more
		The amount of income tax to be withheld shall be—										
$0	$13	18% of wages	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
13	14	$2.40	.10	0	0	0	0	0	0	0	0	0
14	15	2.60	.30	0	0	0	0	0	0	0	0	0
15	16	2.80	.50	0	0	0	0	0	0	0	0	0
16	17	3.00	.70	0	0	0	0	0	0	0	0	0
17	18	3.20	.80	0	0	0	0	0	0	0	0	0
18	19	3.30	1.00	0	0	0	0	0	0	0	0	0
19	20	3.50	1.20	0	0	0	0	0	0	0	0	0
20	21	3.70	1.40	0	0	0	0	0	0	0	0	0
21	22	3.90	1.60	0	0	0	0	0	0	0	0	0
22	23	4.10	1.70	0	0	0	0	0	0	0	0	0
23	24	4.20	1.90	0	0	0	0	0	0	0	0	0
24	25	4.40	2.10	0	0	0	0	0	0	0	0	0
25	26	4.60	2.30	0	0	0	0	0	0	0	0	0
26	27	4.80	2.50	.20	0	0	0	0	0	0	0	0
27	28	5.00	2.60	.30	0	0	0	0	0	0	0	0
28	29	5.10	2.80	.50	0	0	0	0	0	0	0	0
29	30	5.30	3.00	.70	0	0	0	0	0	0	0	0
30	31	5.50	3.20	.90	0	0	0	0	0	0	0	0
31	32	5.70	3.40	1.10	0	0	0	0	0	0	0	0
32	33	5.90	3.50	1.20	0	0	0	0	0	0	0	0
33	34	6.00	3.70	1.40	0	0	0	0	0	0	0	0
34	35	6.20	3.90	1.60	0	0	0	0	0	0	0	0
35	36	6.40	4.10	1.80	0	0	0	0	0	0	0	0
36	37	6.60	4.30	2.00	0	0	0	0	0	0	0	0
37	38	6.80	4.40	2.10	0	0	0	0	0	0	0	0
38	39	6.90	4.60	2.30	0	0	0	0	0	0	0	0
39	40	7.10	4.80	2.50	.20	0	0	0	0	0	0	0
40	41	7.30	5.00	2.70	.40	0	0	0	0	0	0	0
41	42	7.50	5.20	2.90	.50	0	0	0	0	0	0	0
42	43	7.70	5.30	3.00	.70	0	0	0	0	0	0	0
43	44	7.80	5.50	3.20	.90	0	0	0	0	0	0	0
44	45	8.00	5.70	3.40	1.10	0	0	0	0	0	0	0
45	46	8.20	5.90	3.60	1.30	0	0	0	0	0	0	0
46	47	8.40	6.10	3.80	1.40	0	0	0	0	0	0	0
47	48	8.60	6.20	3.90	1.60	0	0	0	0	0	0	0
48	49	8.70	6.40	4.10	1.80	0	0	0	0	0	0	0
49	50	8.90	6.60	4.30	2.00	0	0	0	0	0	0	0
50	51	9.10	6.80	4.50	2.20	0	0	0	0	0	0	0
51	52	9.30	7.00	4.70	2.30	0	0	0	0	0	0	0
52	53	9.50	7.10	4.80	2.50	.20	0	0	0	0	0	0
53	54	9.60	7.30	5.00	2.70	.40	0	[illegible]	0	0	0	0
54	55	9.80	7.50	5.20	2.90	.60	0	0	0	0	0	0

weekly: *payroll period—Continued*

And the wages are—		And the number of withholding exemptions claimed is—										
At least	But less than	0	1	2	3	4	5	6	7	8	9	10 or more
		The amount of income tax to be withheld shall be—										
55	56	10.00	7.70	5.40	3.10	.80	0	0	0	0	0	0
56	57	10.20	7.90	5.60	3.20	.90	0	0	0	0	0	0
57	58	10.40	8.00	5.70	3.40	1.10	0	0	0	0	0	0
58	59	10.50	8.20	5.90	3.60	1.30	0	0	0	0	0	0
59	60	10.70	8.40	6.10	3.80	1.50	0	0	0	0	0	0
60	62	11.00	8.70	6.40	4.10	1.70	0	0	0	0	0	0
62	64	11.30	9.00	6.70	4.40	2.10	0	0	0	0	0	0
64	66	11.70	9.40	7.10	4.80	2.50	.20	0	0	0	0	0
66	68	12.10	9.80	7.40	5.10	2.80	.50	0	0	0	0	0
68	70	12.40	10.10	7.80	5.50	3.20	.90	0	0	0	0	0
70	72	12.80	10.50	8.20	5.90	3.50	1.20	0	0	0	0	0
72	74	13.10	10.80	8.50	6.20	3.90	1.60	0	0	0	0	0
74	76	13.50	11.20	8.90	6.60	4.30	2.00	0	0	0	0	0
76	78	13.90	11.60	9.20	6.90	4.60	2.30	0	0	0	0	0
78	80	14.20	11.90	9.60	7.30	5.00	2.70	.40	0	0	0	0
80	82	14.60	12.30	10.00	7.70	5.30	3.00	.70	0	0	0	0
82	84	14.90	12.60	10.30	8.00	5.70	3.40	1.10	0	0	0	0
84	86	15.30	13.00	10.70	8.40	6.10	3.80	1.50	0	0	0	0
86	88	15.70	13.40	11.00	8.70	6.40	4.10	1.80	0	0	0	0
88	90	16.00	13.70	11.40	9.10	6.80	4.50	2.20	0	0	0	0
90	92	16.40	14.10	11.80	9.50	7.10	4.80	2.50	.20	0	0	0
92	94	16.70	14.40	12.10	9.80	7.50	5.20	2.90	.60	0	0	0
94	96	17.10	14.80	12.50	10.20	7.90	5.60	3.30	.90	0	0	0
96	98	17.50	15.20	12.80	10.50	8.20	5.90	3.60	1.30	0	0	0
98	100	17.80	15.50	13.20	10.90	8.60	6.30	4.00	1.70	0	0	0
100	105	18.50	16.10	13.80	11.50	9.20	6.90	4.60	2.30	0	0	0
105	110	19.40	17.00	14.70	12.40	10.10	7.80	5.50	3.20	.90	0	0
110	115	20.30	17.90	15.60	13.30	11.00	8.70	6.40	4.10	1.80	0	0
115	120	21.20	18.80	16.50	14.20	11.90	9.60	7.30	5.00	2.70	.40	0
120	125	22.10	19.70	17.40	15.10	12.80	10.50	8.20	5.90	3.60	1.30	0
125	130	23.00	20.60	18.30	16.00	13.70	11.40	9.10	6.80	4.50	2.20	0
130	135	23.90	21.50	19.20	16.90	14.60	12.30	10.00	7.70	5.40	3.10	.80
135	140	24.80	22.40	20.10	17.80	15.50	13.20	10.90	8.60	6.30	4.00	1.70
140	145	25.70	23.30	21.00	18.70	16.40	14.10	11.80	9.50	7.20	4.90	2.60
145	150	26.60	24.20	21.90	19.60	17.30	15.00	12.70	10.40	8.10	5.80	3.50
150	160	27.90	25.60	23.30	21.00	18.70	16.40	14.10	11.70	9.40	7.10	4.80
160	170	29.70	27.40	25.10	22.80	20.50	18.20	15.90	13.50	11.20	8.90	6.60
170	180	31.50	29.20	26.90	24.60	22.30	20.00	17.70	15.30	13.00	10.70	8.40
180	190	33.30	31.00	28.70	26.40	24.10	21.80	19.50	17.10	14.80	12.50	10.20
190	200	35.10	32.80	30.50	28.20	25.90	23.60	21.30	18.90	16.60	14.30	12.00
		18 percent of the excess over $200 plus—										
$200 and over		36.00	33.70	31.40	29.10	26.80	24.50	22.20	19.80	17.50	15.20	12.90

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Appendix 33

F. I. C. A. Employee Tax Table

(1) Wages	Soc. Sec. Tax	(2) Wages	Soc. Sec. Tax	(3) Wages	Soc. Sec. Tax	(4) Wages	Soc. Sec. Tax	(5) Wages	Soc. Sec. Tax
35.73	$1.30	$48.14	$1.75	$60.56	$2.20	$72.97	$2.65	$85.38	$3.10
36.00	1.31	48.42	1.76	60.83	2.21	73.25	2.66	85.66	3.11
36.28	1.32	48.69	1.77	61.11	2.22	73.52	2.67	85.94	3.12
36.56	1.33	48.97	1.78	61.38	2.23	73.80	2.68	86.21	3.13
36.83	1.34	49.25	1.79	61.66	2.24	74.07	2.69	86.49	3.14
37.11	1.35	49.52	1.80	61.94	2.25	74.35	2.70	86.76	3.15
37.38	1.36	49.80	1.81	62.21	2.26	74.63	2.71	87.04	3.16
37.66	1.37	50.07	1.82	62.49	2.27	74.90	2.72	87.32	3.17
37.94	1.38	50.35	1.83	62.76	2.28	75.18	2.73	87.59	3.18
38.21	1.39	50.63	1.84	63.04	2.29	75.45	2.74	87.87	3.19
38.49	1.40	50.90	1.85	63.32	2.30	75.73	2.75	88.14	3.20
38.76	1.41	51.18	1.86	63.59	2.31	76.00	2.76	88.42	3.21
39.04	1.42	51.45	1.87	63.87	2.32	76.28	2.77	88.69	3.22
39.32	1.43	51.73	1.88	64.14	2.33	76.56	2.78	88.97	3.23
39.59	1.44	52.00	1.89	64.42	2.34	76.83	2.79	89.25	3.24
39.87	1.45	52.28	1.90	64.69	2.35	77.11	2.80	89.52	3.25
40.14	1.46	52.56	1.91	64.97	2.36	77.38	2.81	89.80	3.26
40.42	1.47	52.83	1.92	65.25	2.37	77.66	2.82	90.07	3.27
40.69	1.48	53.11	1.93	65.52	2.38	77.94	2.83	90.35	3.28
40.97	1.49	53.38	1.94	65.80	2.39	78.21	2.84	90.63	3.29
41.25	1.50	53.66	1.95	66.07	2.40	78.49	2.85	90.90	3.30
41.52	1.51	53.94	1.96	66.35	2.41	78.76	2.86	91.18	3.31
41.80	1.52	54.21	1.97	66.63	2.42	79.04	2.87	91.45	3.32
42.07	1.53	54.49	1.98	66.90	2.43	79.32	2.88	91.73	3.33
42.35	1.54	54.76	1.99	67.18	2.44	79.59	2.89	92.00	3.34
42.63	1.55	55.04	2.00	67.45	2.45	79.87	2.90	92.28	3.35
42.90	1.56	55.32	2.01	67.73	2.46	80.14	2.91	92.56	3.36
43.18	1.57	55.59	2.02	68.00	2.47	80.42	2.92	92.83	3.37
43.45	1.58	55.87	2.03	68.28	2.48	80.69	2.93	93.11	3.38
43.73	1.59	56.14	2.04	68.56	2.49	80.97	2.94	93.38	3.39
44.00	1.60	56.42	2.05	68.83	2.50	81.25	2.95	93.66	3.40
44.28	1.61	56.69	2.06	69.11	2.51	81.52	2.96	93.94	3.41
44.56	1.62	56.97	2.07	69.38	2.52	81.80	2.97	94.21	3.42
44.83	1.63	57.25	2.08	69.66	2.53	82.07	2.98	94.49	3.43
45.11	1.64	57.52	2.09	69.94	2.54	82.35	2.99	94.76	3.44
45.38	1.65	57.80	2.10	70.21	2.55	82.63	3.00	95.04	3.45
45.66	1.66	58.07	2.11	70.49	2.56	82.90	3.01	95.32	3.46
45.94	1.67	58.35	2.12	70.76	2.57	83.18	3.02	95.59	3.47
46.21	1.68	58.63	2.13	71.04	2.58	83.45	3.03	95.87	3.48
46.49	1.69	58.90	2.14	71.32	2.59	83.73	3.04	96.14	3.49
46.76	1.70	59.18	2.15	71.59	2.60	84.00	3.05	96.42	3.50
47.04	1.71	59.45	2.16	71.87	2.61	84.28	3.06	96.69	3.51
47.32	1.72	59.73	2.17	72.14	2.62	84.56	3.07	96.97	3.52
47.59	1.73	60.00	2.18	72.42	2.63	84.83	3.08	97.25	3.53
47.87	1.74	60.28	2.19	72.69	2.64	85.11	3.09	97.52	3.54

(6) Wages	Soc. Sec. Tax	(7) Wages	Soc. Sec. Tax
$ 97.80	$3.55	$111.59	$4.05
98.07	3.56	111.87	4.06
98.35	3.57	112.14	4.07
98.63	3.58	112.42	4.08
98.90	3.59	112.69	4.09
99.18	3.60	112.97	4.10
99.45	3.61	113.25	4.11
99.73	3.62	113.52	4.12
100.00	3.63	113.80	4.13
100.28	3.64	114.07	4.14
100.56	3.65	114.35	4.15
100.83	3.66	114.63	4.16
101.11	3.67	114.90	4.17
101.38	3.68	115.18	4.18
101.66	3.69	115.45	4.19
101.94	3.70	115.73	4.20
102.21	3.71	116.00	4.21
102.49	3.72	116.28	4.22
102.76	3.73	116.56	4.23
103.04	3.74	116.83	4.24
103.32	3.75	117.11	4.25
103.59	3.76	117.38	4.26
103.87	3.77	117.66	4.27
104.14	3.78	117.94	4.28
104.42	3.79	118.21	4.29
104.69	3.80	118.49	4.30
104.97	3.81	118.76	4.31
105.25	3.82	119.04	4.32
105.52	3.83	119.32	4.33
105.80	3.84	119.59	4.34
106.07	3.85	119.87	4.35
106.35	3.86	120.14	4.36
106.63	3.87	120.42	4.37
106.90	3.88	120.69	4.38
107.13	3.89	120.97	4.39
107.45	3.90	121.25	4.40
107.73	3.91	121.52	4.41
108.00	3.92	121.80	4.42
108.28	3.93	122.07	4.43
108.56	3.94	122.35	4.44
108.83	3.95	122.63	4.45
109.11	3.96	122.90	4.46
109.38	3.97	123.18	4.47
109.66	3.98	123.45	4.48
109.94	3.99	123.73	4.49
110.21	4.00	124.00	4.50
110.49	4.01	124.28	4.51
110.76	4.02	124.56	4.52
111.04	4.03	124.83	4.53
111.32	4.04	125.11	4.54

Appendix 34

Complete the partial change memorandum: Change sheet July 27, 197_

NAME	NET WAGES		$20	$10	$5	$1	50¢	25¢	10¢	5¢	1¢
Alden, L.	90	60									
Boyer, J.	102	11									
Dodge, F.	102	92									
Totals											

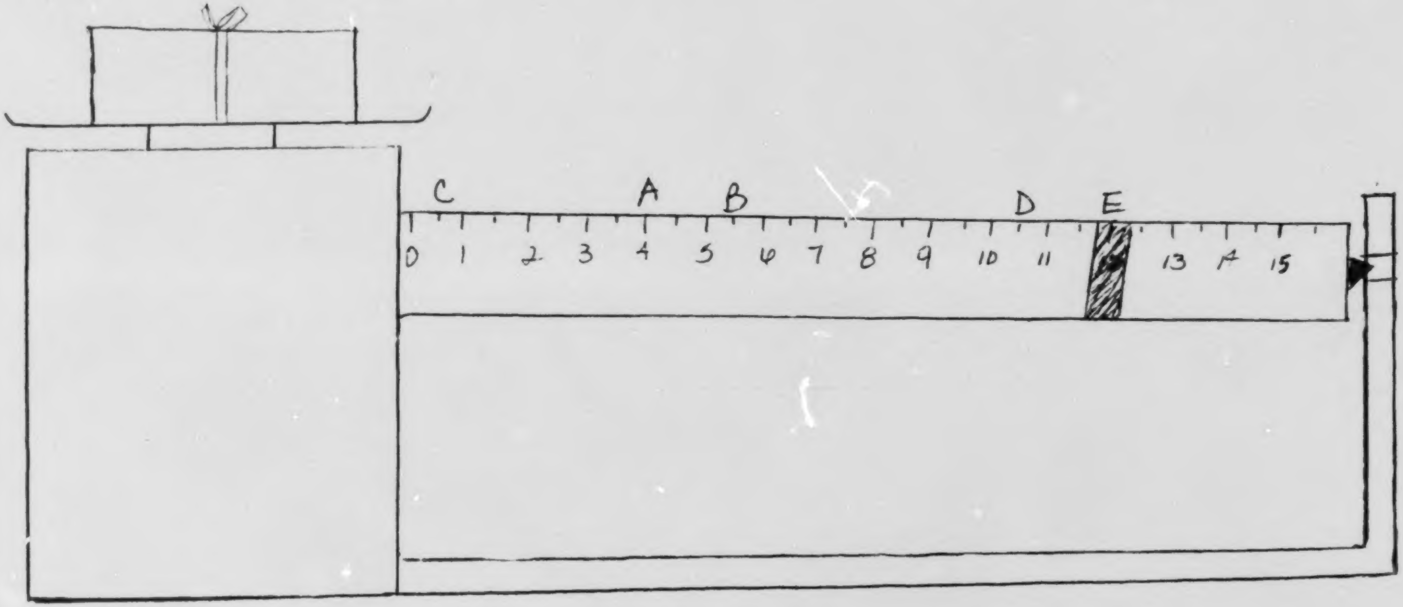
CHANGE MEMORANDUM			
DENOMINATION	NO.	AMOUNT	
$20.00			
10.00			
5.00			
1.00			
.50			
.25			
.10			
.05			
.01			
TOTAL			

(Top- 4,1,1,1,1,0,1,1,1,
5,0,0,2,0,0,1,0,1,
5,0,0,2,1,1,1,1,2,
Bottom- 14-280.00
1-10.00
1-5.00
5-5.00
2-1.00
1-.25
3-.30
2-.10
4-.04
Total 301.69

Top Totals- 301.69, 14, 1,
1, 5, 2, 1, 3,
2, 4

Appendix 35

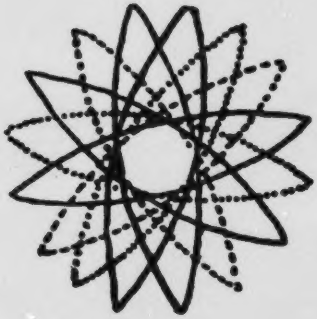
At a rate of $.56 per ounce, calculate the postage required for the packages balancing the scales at the points shown:



A. ____________ B. ____________ C. ____________

D. ____________ ____________ E. ____________

COMMUNICATIONS



WHAT IS THE COMMUNICATION CLUSTER?

It is the study of the basic process of graphic, audiovisual, and electronic communications which include the curriculum area of drafting and design, graphic arts, photography, radio and television broadcasting, electricity, and electronics.

Experiences will aid students to identify and evaluate their interest, abilities, value judgments and needs as they relate to communications in our society. Students who desire may gain a marketable skill in one or more of the occupations in the communication cluster.

Instructional areas include architectural drafting, machine drafting, engineering drafting, technical illustration, closed circuit TV, radio broadcasting, offset printing, screen printing, photography, relief printing, radio and sound equipment repair, appliance repair, and electro-mechanical technology.

SUGGESTED COURSE OFFERINGS
LEADING TO OCCUPATIONS
IN THE
COMMUNICATIONS FIELD

DRAFTING

ARCHITECTURAL DRAFTSMAN

Suggested Courses:
- Introduction to Drafting
- Architectural Drafting I
- Architectural Drafting II
- Architectural Drafting III

ELECTRICAL DRAFTSMAN

Suggested Courses:
- Introduction to Drafting
- Mechanical Drafting I
- Architectural Drafting I
- Machine Drafting I
- Electrical Drafting I

ENGINEERING DRAFTSMAN

Suggested Courses:
- Introduction to Drafting
- Mechanical Drafting I
- Mechanical Drafting II
- Machine Drafting I
- Machine Drafting II
- Engineering Drafting I

MACHINE DRAFTING

Suggested Courses:
- Introduction to Drafting
- Mechanical Drafting I
- Mechanical Drafting II
- Machine Drafting I
- Machine Drafting II
- Machine Drafting III
- Engineering Drafting I

TECHNICAL ILLUSTRATOR

Suggested Courses:
- Introduction to Drafting
- Mechanical Drafting I
- Mechanical Drafting II
- Machine Drafting I
- Technical Illustration

ELECTRONICS

CLOSED CIRCUIT TV TRAINEE

Suggested Courses:
- Closed Circuit TV I
- Closed Circuit TV II
- Closed Circuit TV III

COMMUNICATIONS FIELD
(Cont)

ELECTRO-MECHANICAL TECHNICIAN

Suggested Courses:
- Electricity I
- Electronics I
- Electronics II
- Electro-Mechanical Technology I
- Electro-Mechanical Technology II
- Electro-Mechanical Technology III

LARGE APPLIANCE REPAIRMAN

Suggested Courses:
- Electricity I
- Electronics I
- Major Appliance Servicing I
- Major Appliance Servicing II
- Major Appliance Servicing III

SMALL APPLIANCE REPAIRMEN

Suggested Courses:
- Electricity I
- Electronics I
- Electricity-Electronics
- Small Appliance Repair I
- Small Appliance Repair II

RADIO BROADCAST TRAINEE

Suggested Courses:
- First-year Courses:
  - Basic Radio Station Operation
  - Radio Station Operation and Program Production
  - Advanced Radio Program Production
- Second-year Courses:
  - Radio Programming and Announcing I
  - Radio Programming and Announcing II
  - Radio Programming and Announcing III
- Third-year Courses:
  - Radio Programming and Announcing IV
  - Radio Programming and Announcing V
  - Radio Programming and Announcing VI

**Radio Broadcasting courses must be taken in the above sequence

RADIO-SOUND EQUIPMENT REPAIR TRAINEE

Suggested Courses:
- Electricity I
- Electronics I
- Electronics II
- Radio-Sound Equipment Repair I
- Radio-Sound Equipment Repair II
- Radio-Sound Equipment Repair III
- Introduction to Television Repair

GRAPHIC ARTS

GRAPHIC ARTS TRAINEE

Suggested Courses:
- Graphic Arts I
- Graphic Arts II
- Graphic Arts V

OFFSET PRINTER

Suggested Courses:
- Graphic Arts I
- Graphic Arts II
- Graphic Arts III
- Offset Printing I
- Offset Printing II
- Offset Printing III

COMMUNICATIONS FIELD
(Cont)

IN-PLANT PRINTER

Suggested Courses:
- Graphic Arts I
- Graphic Arts II
- Graphic Arts III
- Offset Printing I
- Offset Printing II
- Bindery I

SILK SCREEN PRINTER

Suggested Courses:
- Graphic Arts I
- Graphic Arts II
- Screen Printing I
- Screen Printing II

AUTOMATIC LETTERPRESS PRINTER

Suggested Courses:
- Graphic Arts I
- Graphic Arts II
- Automatic Letterpress I
- Automatic Letterpress II

COMMERCIAL PHOTOGRAPHER

Suggested Courses:
- Basic Photography
- Photography I
- Photography II
- Photography III

Cluster COMMUNICATIONS

Occupation

Guide Architectural Drafting I #9601

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 63 of

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Percents and Decimals in Application	Basic Sr. Math	Understanding the costs of buying a home or constructing a home	Banking Estimating Contracting	See Appendix I
Measurement of angles and line and then describing them	Geometry and Algebra Trig.	Do simple surveying problems	Engineering Navigation	See Appendix II
Measurement and concept of accuracy	Sr. Math Geometry	Floor plan development in home construction	Architecture Engineering Estimating	See Appendix III
Ratio-proportion slope	Algebra and Geometry	Stairway construction, treads, risers, etc.	Carpentry Building Insp. Engineering Fire Control	See Appendix IV

103a

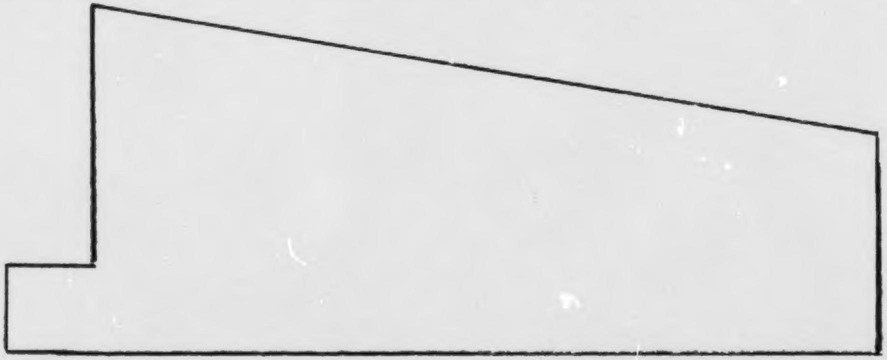
APPENDIX I

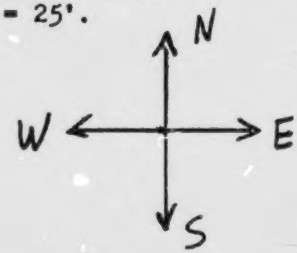
A. A bank will loan (approximately) 2/3 or $66\frac{2}{3}\%$ of the real value of a home. What size loan could a buyer get if the cost of a home is $56,000?

B. A contractor feels he should make a 12% profit on a home he is constructing to sell. What price should he ask on a home that cost him $35,000 to build?

APPENDIX II

A lot owner wishes to have his land surveyed. Using point A as a reference point - describe his land. The drawing below has a scale of 1" = 25'.

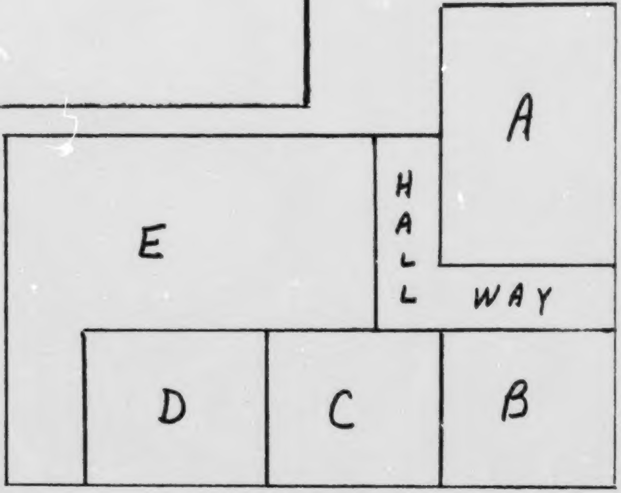




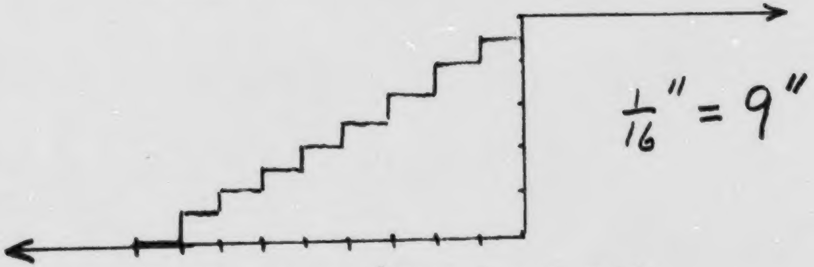
APPENDIX III

A. Using the scale ¼" = 4', determine the dimensions of each lettered room.

B. What are the dimensions of the hallway?



APPENDIX IV



A. What is the depth of each step?

B. What is the height of each step?

C. What is the slope of the stairway?

Cluster Communications

Occupation ____________

Guide Electrical Appliance Repair (Small) I, #9626

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 66 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Operations with rational numbers	General Math Math Concepts Senior Math Discovery Math	Record keeping. Ordering of parts for appliances. Measurement of wire. See Appendix I		
Equations Ratio and Proportion	Math Concepts Senior Math Algebra I Geometry Discovery Math	Determine Inductive Reactance and Capacitor Reactance by using Ohms law. See Appendix II		
Converting to decimal fraction	Math Concept Senior Math Discovery Math	Determining sums of resistance in parallel circuits. See Appendix II		
Reciprocals	General Math Senior Math Math Concepts Discovery Math	Find the sums of resistance in parallel circuits. See Appendix III		
Powers of 10 and exponents using both positive and negative exponents	Math Concepts Senior Math Discovery Math Algebra I	Use the power formula $P=I^2R$. Conversion of metric units: For example Converting micro amps to amps. See Appendix IV		
Irrational numbers used in second degree equations	Math Concepts Algebra I Geometry Adv. Algebra Trig - Math Analysis	Use Ohms and Watts law in the power formula. Finding current lag and current lead in power phase using pythagorous theorem See Appendix V		

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Occupation

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OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 67 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Trigonometric equations	Algebra I Geometry Advanced Algebra Trigonometry	Find power lag and power lead in power phase. See Appendix VI		
Decimal Conversion Factors in the metric system	Math Concepts Senior Math Algebra I Discovery Math	Change from a smaller to larger, or larger to smaller electrical unit. See Appendix VII		
Percent	Math Concepts Senior Math Discovery Math Geometry Algebra I	Figure sales tax. See Appendix I Mixture of tin and lead to make solder of a specific melting temperature. Find power efficiency in percent. See Appendix VIII		
Reading Number Line	General Math Senior Math Discovery Math Math Concepts Algebra I Geometry	Reading the needle deflection on an electrical instrument such as an ammeter, voltmeter and ohmeter. See Appendix IX		
Points lines, planes and angles	General Math Math Concepts Senior Math Geometry Discovery Math	Schematic drawing of electrical circuits.		

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OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 68 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Graphs	Math Concepts Senior Math Algebra I Geometry Discovery Math	Picturing current intensity in amperes with respect to time in alternating current and direct current. (See Appendix X)		

Example 1 Here is a bill for a toaster repair. Total the bill and find the Minnesota Sales tax at 4%

APEX APPLIANCE

____

Date ________________

Billed To ________________________________

	Replaced thermostat	1	46
	Repair of element	2	69
	Labor	5	75
	Minnesota Sales Tax 4%		
	Total		

Example 1 Solve for r

$$\frac{3}{r} = \frac{9}{6}$$

Example 2 Solve for E

$$\frac{R}{I} = \frac{E}{N}$$

Example 3 Solve for w

$$4w - 7 = 3w + 9$$

Example 4 Percent Efficiency = $\frac{\text{Watts Output}}{\text{Watts Input}} \times 100$

Find the percent efficiency of a machine if the Watts output = 45
Watts input = 65

Example 1 Change 1/4 to a decimal fraction

Example 2 Change the following to decimal fractions to the nearest hundredth

(a) 1/3

(b) 5/8

(c) 17/26

(d) 1/45

Example 3 Change each of the following fractions to its reciprocal

(a) 1/2

(b) 5/9

(c) 1/R

(d) .25

Example 4 If $\frac{1}{R_T} = \frac{R_1 + R_2}{R_1 R_2}$

$\frac{R_T}{1}$ or $R_T =$

Appendix IV

Example 1 (a) 3^3 = ____ x ____ x ____ = ________

(b) 2^5 = ____________________

(c) 10^2 = ____________________

Example 2 Express as a power of 10. What power of 10 would make these true.

(a) $125 = 1/25 \times 10^{(\_\_)}$

(b) $4325 = 4.325 \times 10^{(\_\_)}$

(c) $9685 = 96.85 \times 10^{(\_\_)}$

(d) $.0041 = 4.1 \times 10^{(\_\_)}$

(e) $.000006 = 6 \times 10^{(\_\_)}$

Example 3 In the power formula $P = I^2R$

$I = 3.5$ amps $R = 4$ ohms Find P

Appendix V

Example 1 Find the roots of the following numbers

(a) $\sqrt{9}$ (b) $\sqrt{144}$ (c) $\sqrt[3]{8}$ (d) $\sqrt{256}$

Example 2 Using the power formula $P = I^2R$ find
I if $P = 588$ and $R = 3$

Ampers (I) = $\sqrt{\frac{W}{R}}$ where W = power in watts and R = resistance in ohms. Find
I when $w = 75$ and $R = 3$

Example 3 $r^2 = x^2 + y^2$

Find r when $x = 12$, $y = 16$

Example 1 The trigonometric equivalent of pythagorous theorem is

$\sin^2 \phi$ + __________ = 1

Example 2 $\sin 45^{\circ}$ = ___________

$\cos 45^{\circ}$ = ___________

$\sin 30^{\circ}$ = ___________

$\cos 60^{\circ}$ = ___________

Example 3 Which of the following are positive and which are negative

(a) $\sin 60^{\circ}$

(b) $\cos$ (___55°)

(c) $\sin$ (___55°)

(d) $\cos 65^{\circ}$

(e) $\sin$ (___72°)

Example 1 Change

(a) 5000 watts to kilowatts

(b) 35 micro amps to amps

(c) 6 megavolts to volts

(d) 1320 kilohertz to Hertz

Example 2 A circuit has a current of 2600 milliamps. Can this current be measured with an ammeter whose range is 0 - 3 amps

Example 3 Place the correct power of 10

(a) $.0004 = 4 \times 10^{(\_\_)}$

(b) $.00869 = 8.69 \times 10^{(\_\_)}$

(c) $.123 = 12.3 \times 10^{(\_\_)}$

Example 4 Place the factor in front of the power of 10 that would make the statement true.

(a) 13 = ____________ $\times 10^{1}$

(b) 186 = ____________ $\times 10^{2}$

(c) 186 = ____________ $\times 10^{-2}$

(d) 1864 = ____________ $\times 10^{6}$

Example 1 What is 43% of 80

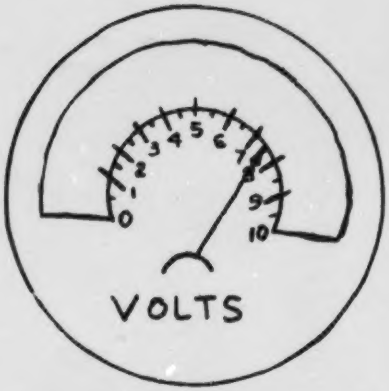
Example 2 Solder is a mixture of tin and lead. If it requires 63% tin to get a melting point of 358°, what % lead does the mixture contain?

Example 3 Solder, a mixture of tin and lead, is 70% tin and weighs 10 lbs. How many pounds of lead is there in this solder?

Example 4 Percent efficiency = $\frac{\text{Watts output}}{\text{Watts Input}} \times 100$

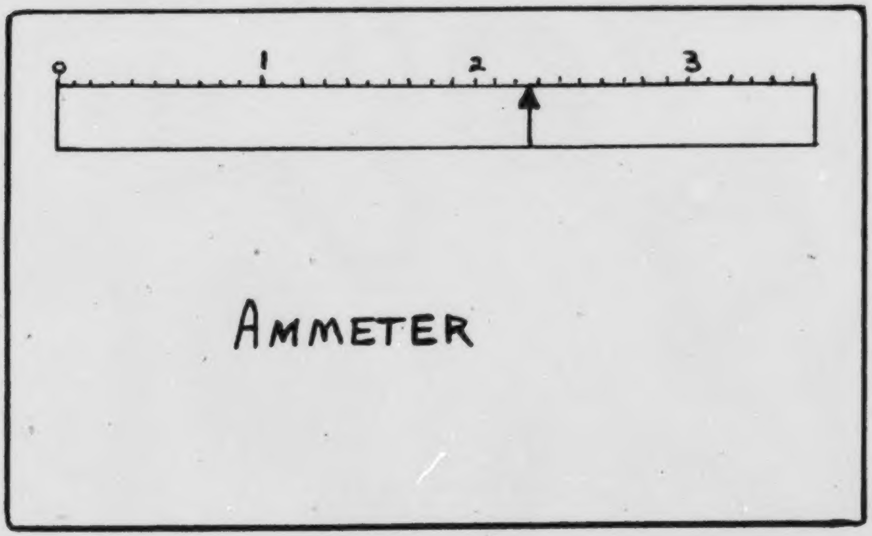
Find the percent efficiency if the watts output is 100 and the watts input is 135.

Example 1



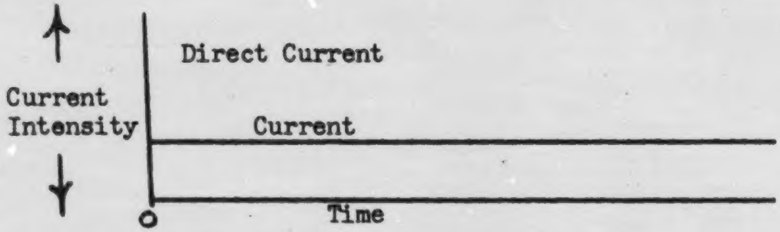
Give the number of volts to the nearest one-half volt.

Example 2



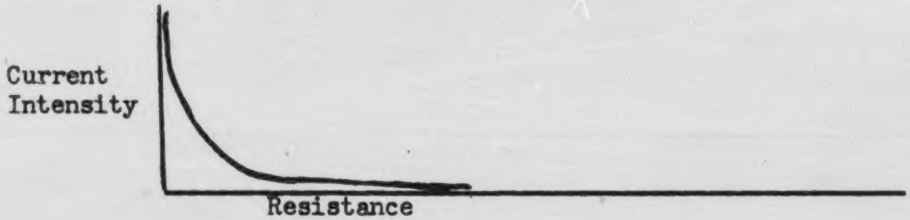
Give the number of amperes to the nearest tenth of an amp.

Example 1



How does current intensity vary with respect to time?

Example 2



How does current Intensity vary with resistance?

Cluster Communications

Occupation

Guide Electrical Appliance Repair (Small) II, #9949

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 78 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Operation with rational numbers	General Math Math Concepts Senior Math Math Discovery	Measurement of length and amount. Addition of resistors and voltages in a series circuit. Addition of currents in a parallel circuit.		
Ratio and proportion Equations	General Math Math Concepts Senior Math Discovery Math Algebra I, Geometry	Ohms and Watts law in electrical circuits. See Appendix I		
Converting common fractions to decimal fractions	General Math Math Concepts Senior Math Discovery Math	Determine total resistance in a parallel electrical circuits See Appendix II		
Reciprocals	General Math Math Concepts Senior Math Discovery Math	Determining total resistance in a parallel electrical circuit. See Appendix II		
Exponents	General Math Math Concepts Algebra I Senior Math Discovery Math	Used in the power formula determination of power lag or power lead. Ohms law modified for alternating current See Appendix III		

Cluster Communications

Occupation

Guide Electrical Appliance Repair (Small) II, #9949

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 79 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Irrational numbers	Math Concepts Senior Math Algebra I Discovery Math Geometry, Adv. Algebra	Used in power formulas and formulas dealing with alternating current. See Appendix IV		
Points, lines, planes and angles	General Math Math Concepts Senior Math Geometry Discovery Math	Drawing circuit diagrams		
Metric system of measurement	General Math Math Concepts Senior Math Discovery Math	Change from smaller to larger and from larger to smaller electrical units See Appendix V		
Trigonometric functions	Algebra 1 Discovery Math Math Concepts Geometry Adv. Algebra Trigonometry Math Analysis	Ohms and Watts law modified for alternating current See Appendix VI		
Reading a number line	General Math Math Concepts Senior Math Math Discovery	Read testing meters Aee Appendix VII		

Example 1 In the watts formula $W = I \cdot E$ find W if $I = 6$ amps and $E = 24$ volts

Example 2 Solve for y

$$\frac{8}{y} = \frac{1.4}{.19}$$

Example 3 Solve for R_T in the formula $R_T = \frac{1}{r_1} + \frac{1}{r_2}$

if $r_1 = 6$; $r_2 = 9$

Example 4 In the formula $Z = \frac{E}{I}$

find E in volts of $Z = 15$; $I = 8$

Example 1 Change 3/4 to a decimal fraction

Example 2 Change the following to decimal fractions to the nearest thousandth

(a) 1/6
(b) 7/8
(c) 13/16
(d) 18/97

Example 3 Change each of the following to its reciprocal

(a) 1/3 (b) 4 (c) $\frac{2}{N}$
(d) .2

Example 4 $\frac{1}{R} = \frac{1}{9} + \frac{1}{13} + \frac{1}{23}$

Change each fraction to its decimal equivalent to the nearest hundredth and then find R.

Example 1

(a) $4^3 =$ ____________

(b) $2^5 =$ ____________

(c) The factors of p^2 are ____________________

Example 2 Using the formula for power

$W = I^2R$

find W when $I = 3$; $R = 6$

Example 3 Using the formula for power

$W = I^2R$

find R when $W = 150$; $I = 3$

Example 4 In the power factor formula

$$\text{Power Factor} = \frac{W}{I^2Z}$$

find the power factor if $W = 200$ watts; $I = 4$ amps; $Z = 80$ ohms

Example 1 (a) $\sqrt{25} =$ ________

(b) $\sqrt{196} =$ ________

Example 2 $\sqrt{235}$ if between what two whole numbers

Example 3 Using the formula

$$I = \sqrt{\frac{W}{R}}$$

find I if W = 160 watts; R = 10 ohms

Example 4 Using the formula

$$R = \frac{E^2}{W}$$

solve for E when R = 36 ohms; W =64 watts

Example 5 In an alternating current circuit

$$R = \sqrt{Z^2 - X^2}$$ where

the Impedence Z = 5 ohms and
the reactance X = 3 ohms. Find
the resistance R.

Appendix V

Example 1

(a) To change from units to microunits you would multiply by ____________

(b) To change from mega units to kilo units you would ____________________ by 1000

(c) To change from kilo units to units you would __________________ by 1000

Example 2

(a) One milliampere = _________________ampere

(b) One kilowatt = __________________watts

(c) One megahertz = _________________hertz

Appendix VI

Example 1 In alternating current formula for

Impendance $Z = \dfrac{W}{I^2 \cos \theta}$

$W = 250$ watts; $I = 5$ amps and $\theta = 0^\circ$ lag.

Find Z

Example 2 In alternating current

$E(\text{in volts}) = \sqrt{\dfrac{WZ}{\cos \theta}}$

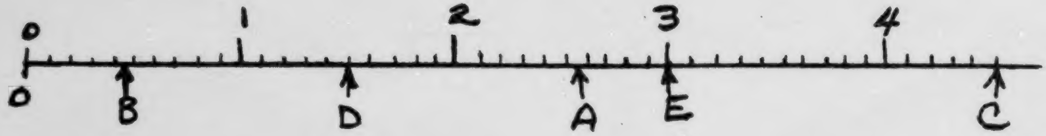
find E when $W = 32$ watts

$Z = 2$ ohms

$\theta(\text{lag}) = 0^\circ$

(b) Could θ be a 90° lag

Example 1



Read to the nearest tenth the following on the number line above

A ____________

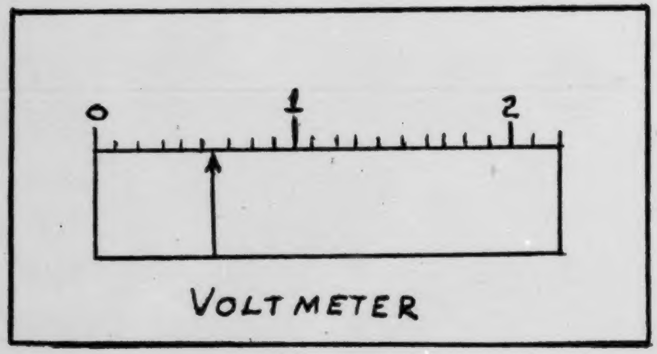
B ____________

C ____________

D ____________

E ____________

Example 2



To the nearest tenth how many volts does this voltmeter register

Cluster Communications

Occupation

Guide Electricity I #9614

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

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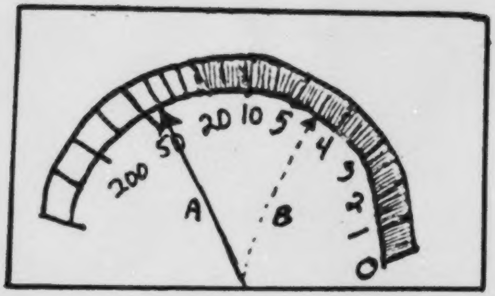
MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Read a scale	General Math	Read a VOM. See Appendix Problems 1, 2	Science	
Add, subtract, multiply, divide round whole numbers, fractions, decimals.	General Math	Compute voltage on VOM scale, solving Ohm's Law, converting units. See Appendix Problems 2, 4, 7	Science	
Understand metric prefixes, symbols, calculate in metric	General Math	Recognize units of power. Convert powers over. See Appendix Problems 3, 7, 10	Science (Physics)	
Read a graph	General Math	Understand sine wave 4. Understand Alternators. See Appendix Problem 4.	Physics	
Proportion	General Math Algebra Geometry	Magnetic attraction. See Appendix Problem 5.	Science	
Use Percents	General Math	Calculate tolerance range of a system, understand output and efficiency. See Appendix Problem 6.	Science, Social Studies, Economics	
Use formulas by substituting values, solving formulas for other unknowns.	Algebra	Convert units, solve Ohm's Law problems involving amperes, volts, resistance and watts. See Appendix Problems 7, 8, 9, 10.	Science, Economics	

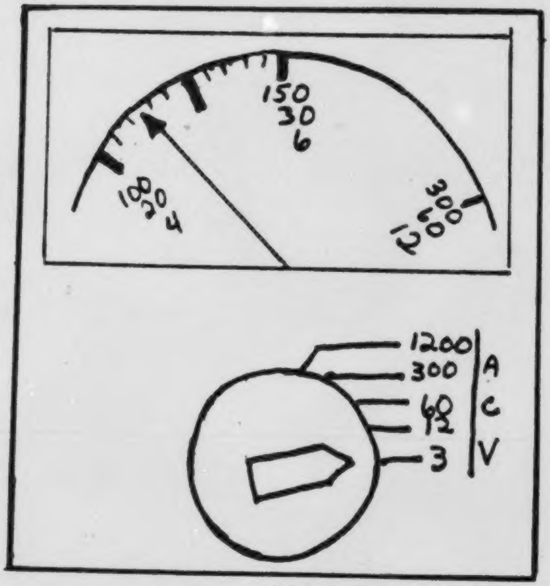
Appendix



Example 1: What are the readings on the OHM scale of the VOM?

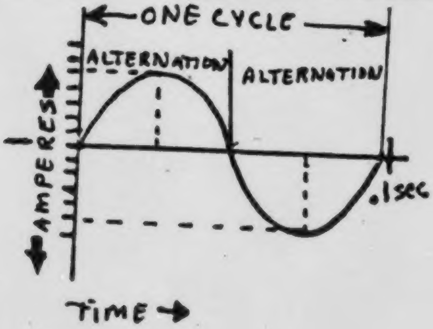
A.________

B.________



Example 2: Calculate the reading on the ac VOM scale.

Example 3: The prefix Milli- means________ and Kilo- means________. Mega- means________ and Micro- means ________.



Example 4: Explain the diagram of the sine wave. What is the frequency of the figure shown?

Example 5: Two magnets are positioned so the north pole of one is 2 inches from the south pole of the other. If they are moved so they are only 1/2 inch apart, how many times (greater/less) would their attraction be?
choose one

Example 6: A 100 - Ohm resistor has a tolerance of 5%. What is the allowable range?

Example 7: How much will it cost to run six 60-watt lamps five hours a day if the rate is $.0675 per kilowatt hour?

Example 8: What is the resistance of a conductor if 150 volts is needed to force 3 amperes of current through it?

Example 9: A. If P = IxE and E = IxR, express P in terms of I and R only.

B. What is the power if 2 amps flow through a conductor whose resistance is 5 Ohms?

Example 10: 470,000 Ω = ________ KΩ = ________ MΩ

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Guide Electrical Drafting #9608

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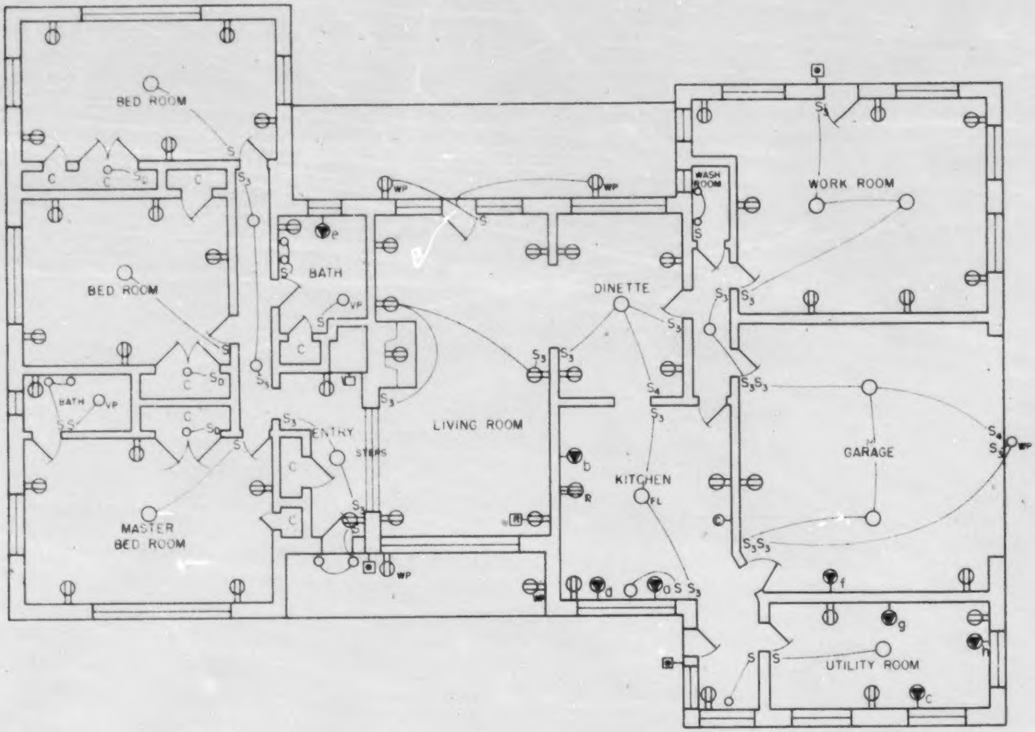
PLEASE REFER TO MECHANICAL DRAFTING I-9604, MACHINE DRAFTING 9605, and ENGINEERING DRAFTING 9607 FOR MATHEMATICAL CONCEPTS THAT ARE DUPLICATED IN ELECTRICAL DRAFTING.

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement	Basic Math	Dimensioning electrical drawings	Electrical Technician Electronics Computers	See Appendix I
Solving Equations	Algebra	Solving electrical equations	Electrical Technician Engineering	See Appendix II

APPENDIX I

Floor plan for a home showing the electrical requirements.



The floor plan above shows the electrical requirements in a given home.

Scale: ¼" = 4'

1. What are the dimensions of the master bedroom?

2. How many convenience outlets are in the work room?

3. How many special purpose outlets are in the kitchen?

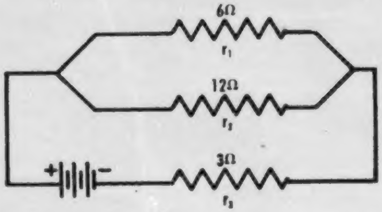
4. What are the dimensions of the utility room?

APPENDIX II

A. What is the total resistance of the circuit if r_1, = 12 ohms, r_2 = 18 ohms and r_3 = 4 ohms?

SAMPLE PROBLEM

What is the total resistance of the following circuit? (The symbol for ohms is Ω.)



Solution:

r_1 and r_2 are in parallel, therefore, their combined resistance (R) is:

1. $\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2}$
2. $\frac{1}{R} = \frac{1}{6} + \frac{1}{12}$
3. $12 = 2R + R$
4. $3R = 12$
5. $R = 4\Omega$

Since the combined resistance of r_1 and r_2 is in series with r_3, the total resistance (R_T) of the circuit is:

1. $R_T = R + r_3$
2. $R_T = 4 + 3 = 7\Omega$ total resistance.

B. Draw the diagram for a fire-protection relay-alarm circuit. Use thermal elements in place of the window contacts and use a horn as the alarm. Try to add a switch that will control the relay when it is necessary to make repairs or changes in the circuit.

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Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Change common fraction to decimal fraction Rounding decimal fractions	General Math Math Concepts Senior Math Algebra I	Use parallel circuits formula See Appendix I		
Ratios and Proportions Solving Equations	Math Concepts Senior Math Discovery Math Algebra I, Geometry	Using Ohms Law, Watts Law, Power ratios See Appendix II		
Reciprocals	Math Concepts Senior Math Discovery Math Algebra I Geometry	Find the total Resistance in a parallel circuit $\frac{1}{R_p} = \frac{1}{4}$; $R_p = 4$ See Appendix III		
Exponents	Math Concepts Senior Math Discovery Math	Finding Power (in Watts) if the amperes and resistance are given $P = I^2R$ See Appendix IV		
Comparing fractions	General Math Math Concepts Senior Math Discovery Math	Select taps, dies, and drills for threading rods and making proper size holes See Appendix V		

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Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Geometric figures Points and lines and angles	General Math Math Concepts Senior Math Discovery Math Geometry	Make simple electrical diagrams using schematic symbols		
Area	General Math Math Concepts Senior Math Discovery Math Geometry	Cut 14 guage sheet metal for an electrical mounting panel See Appendix VI		
Reading a number line	General Math Math Concepts Senior Math Discovery Math	Reading an ammeter and voltmeter See Appendix VII		
Parts of Circle (radius, diameter)	General Math Math Concepts Senior Math Discovery Math Geometry	Cut holes of different diameters in metal panels. Use different diameter wire See Appendix VI		
Positive and Negative numbers Powers of 10 Multiplication and division (Use metric system)	General Math Math Concepts Discovery Math Senior Math Algebra I	Change electrical units using powers of 10 See Appendix VIII		

Appendix I

Example 1 Change 1/5 to a decimal fraction

Example 2 Change 1/3 to a decimal fraction

Example 3 Change 1/7 to a decimal fraction and round the answer to the nearest hundredth.

Example 4 Simplify $\frac{1}{4.5}$ so that the resulting answer is a decimal fraction.

Example 5 Joint resistance R_p of any number of resistances connected in parallel is

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \text{""}$$

Find $\frac{1}{R_p}$ in decimal fraction form if $R_1 = 2$; $R_2 = 4$; and $R_3 = 8$

Appendix II

Example 1 Change 25% to a ratio

Example 2 Solve for n

$$\frac{n}{2} = \frac{6}{1}$$

Example 3 Solve for E in Ohms Law ($I = \frac{E}{R}$)

if R = 8 ohma; I = 6 amps

Example 4 Solve for I in Watts Law ($P = E \cdot I$)

if P = 50 watts; E = 10 volts

Appendix III

Example 1 The reciprocal of 1/2 is ______________.

Example 2 The reciprocal of 3/10 is ______________.

Example 3 The reciprocal of .8 is ______________.

Example 4 $\frac{1}{N} = \frac{3}{4}$; $\frac{N}{1} =$ ____________________.

Example 5 $\frac{1}{R} = \frac{1}{2} + \frac{1}{8}$ R = __________.

Appendix IV

Example 1 $2^3 =$ _____ x _____ x _____

Example 2 $3^4 =$ _________________________

Example 3 $4 \times 4 \times 4 \times 4 \times 4 =$ 4 —________

Example 4 Find n^3 if $n = 5$

Example 5 Power (in watts) is found by the formula $P = I^2R$ if the amperes (I) and resistance (R) are given.

Find P if I = 3 amps and R = 6 ohms

Appendix V

Example 1 Which tap will thread the larger hole $\frac{8}{32}$" or $\frac{1}{4}$"

Example 2 Put the following drills in order from the smallest to the largest

$\frac{1}{8}$", $\frac{4}{64}$", $\frac{8}{32}$", $\frac{32}{64}$", $\frac{18}{32}$"

Appendix VI

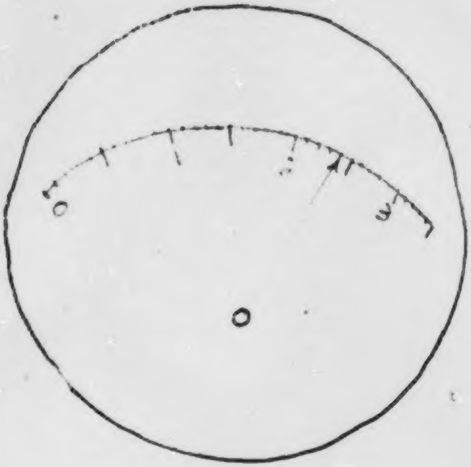
Example 1 How many mounting panels 7" by 13" can be cut rom a 14 guage sheet of metal 12" by 24"?

Example 2 Can five circular mounting holes 3 inches in diameter be drilled in a panel 7" by 13"? If so draw a diagram.

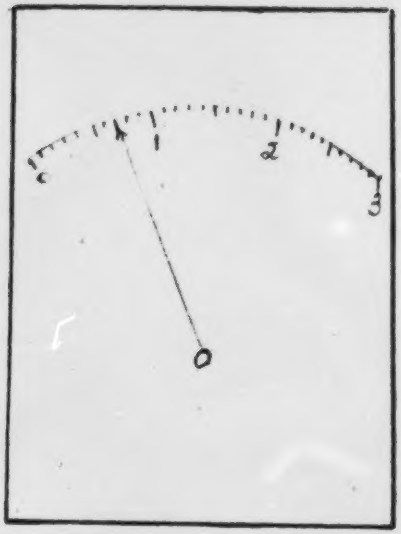
Appendix VII

Read where the pointer indicates to the nearest tenth

Example 1



Example 2



Appendix VIII

Example 1

(a) 4 megavolts = ____________________ millivolts

(b) 14 milliamps = ____________________ amps

(c) 3.2 amps = ____________________ microamps

(d) .4 volts = ____________________ kilovolts

(e) 32 megavolts = ____________________ kilowatts

Example 2

Simplify the following powers of 10

(a) $10^{3} \times 10^{5}$

(b) $10^{-2} \times 10^{-6}$

(c) $10^{3} \times 10^{-2} \times 10^{-1}$

(d) $\frac{10^{4}}{10^{1}}$ (e) ______

(e) $\frac{10^{-2}}{10^{8}}$

(f) $\frac{10^{6} \times 10^{4}}{10^{3}}$

(g) $(2.1 \times 10^{3}) \times (4 \times 10^{2})$

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MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Base operations of addition, subtraction, multiplication and division of rational numbers	General Math Math Concepts Discovery Math Senior Math	Measure lengths of wire and sheet metal material. Work basic electrical formulas and figure costs See Appendix I		
Ratio and Proportion	General Math Math Concepts Senior Math Discovery Math Algebra I Geometry	Use formulas for step up or step down transformers See Appendix II		
Equations	General Math Math Concepts Discovery Math Algebra I Senior Math	Use ohms or watts formula. Solve proportions See Appendix II		
Percents	General Math Math Concepts Discovery Math Senior Math	Know efficiency rating of transformers. Price fixing for parts. Figuring tax. See Appendix II		
Number line	General Math Math Discovery Math Concepts Senior Math	Read gauges and test meters. See Appendix III		

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MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

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Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Metrics and powers of 10	General Math Math Concepts Discovery Math Senior Math	Change from larger to smaller or smaller to larger units of measure See Appendix IV		
Points, lines, planes and angles	General Math Math Concepts Discovery Math Senior Math	Drawing patterns and layouts		
Polygons, Rectangles and Circles	General Math Math Concepts Discovery Math Geometry I Senior Math	Cut out panel from sheet metal. Cut holes in panels to fit parts		
Areas	General Math Math Concepts Discovery Math Senior Math Geometry	Figure amount of sheet metal to use for panels. Figure amount of panel area needed to fit parts on panel See Appendix I		
Comparing fractions	General Math Math Concepts Discovery Math Senior Math	Select correct sizes of drill bits, taps and dies plus correct size of welding rod. See Appendix V		

Example 1	The cost of #16 copper wire is .04 dollars per running foot. What will be the cost for five coils if they each use 300 feet of #16 copper wire?
Example 2	The cost of sheet metal is $1.20 per square foot. How much would three panels 2½ feet by 1½ feet cost?
Example 3	How many panels 2 feet by 1½ feet can you get out of a sheet of metal 4 feet by 4 feet?
Example 4	Six coils each using 275 feet of wire were taken from a spool of wire 2500 feet long. Can you make three more coils from this spool?

Example 1 In the formula $I = \frac{E}{R}$ find E if I = 3.5 amps and R = 2.5 ohms

Example 2 If in a transformer Per cent efficiency = $\frac{\text{Power output}}{\text{Power input}} \times 100$

find the per cent efficiency if Power output = 960 watts

Power input = 1000 watts

Example 3 In a transformer the ratio between the voltage (E_p) across the primary winding and the voltage (E_s) across the secondary winding is equal to the ratio of the number of turns (N_p) of the primary winding and the number of turns (N_s) of the secondary winding

$$\frac{E_p}{E_s} = \frac{N_p}{N_s}$$

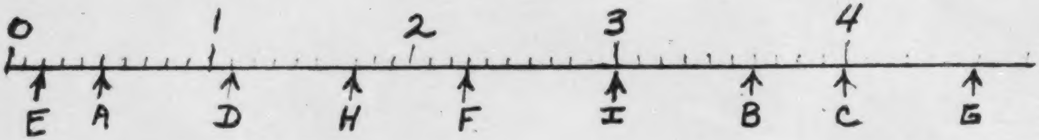
If $E_p = 120$ volts, $E_s = 360$ volts; $N_p = 1000$ turns, find N_s

Example 4 If $W = \frac{I \cdot E}{R}$

find R if W = 15 watts, I = 3 amps; E = 45 volts

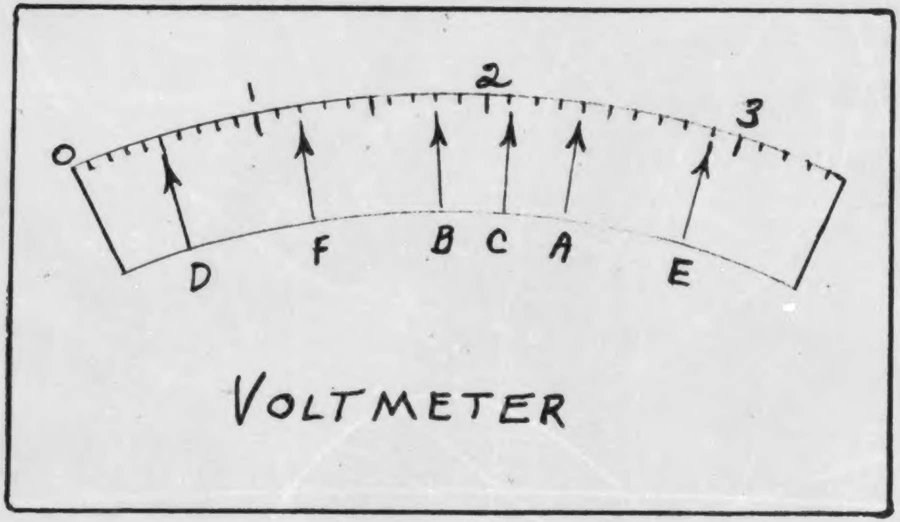
Example 5 In a shipment of 45 transformers three of them were defective. A shipment of 5% defective is normal. Was this a normal shipment?

Example 1 Give the value indicated on the number line below to the nearest tenth



A = ____ B = ____ C = ____ D = ____ F = ____ G = ____ H = ____ I = ____

Example 2 Give the value to the nearest tenth that is indicated by the arrow



A = ____ B = ____ C = ____ D = ____ E = ____ F = ____

Appendix IV

Example 1 Convert the following units

(a) 1 meter = ________________ millimeters

(b) 1 megawatts = ______________ kilowatts

(c) 45 milliamps = ______________ amps

(d) 2 milliamps = ________________ microamps

Example 2 Simplify the following powers of 10

(a) $10^2 \times 10^2$

(b) $10^{-3} \times 10^6$

(c) $10^4 \times 10^1 \times 10^{-2}$

(d) $\frac{10^3}{10^2}$

(e) $\frac{10^{-6} \times 10^4}{10^5}$

Appendix V

Example 1 Put the following drill sizes in order from smallest to largest

$\frac{1}{4}$, $\frac{16}{64}$, $\frac{13}{32}$, $\frac{2}{16}$, $\frac{34}{64}$, $\frac{24}{32}$, $\frac{3}{4}$, $\frac{5}{8}$

Example 2 Place the correct connective

⟷ =

(a) 3/4 ______________ 48/64

(b) 1/4 ______________ 3/16

(c) 7/8 ______________ 26/32

(d) 14/64 ____________ 4/16

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MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Read a scale	General Math	Read a VOM, voltmeter. See Appendix problems 1, 2	Science	
Add, subtract, multiply, divide, round whole numbers, fractions, decimals	General Math	Compute voltage on VOM, solving Ohm's law, converting units, reactance problems, voltmeter, scientific notation. See Appendix problems 2, 4, 7, 8, 10, 11, 12, 13, 15, 16, 17	Science	
Understand metric prefixes, symbols, calculate in metric	General Math	Recognize and convert units of power. See Appendix problems 3, 7, 10, 14	Physics	
Read a graph	General Math Algebra	Interpret sine waves, alternators, charts. See Appendix Problem 4	Physics	
Proportion	General Math, Algebra, Geometry	Magnetic attraction. See Appendix Problem 5	Science	
Use Percents	General Math	Calculate tolerance range of a system, understand output and efficiency. See Appendix Problem 6	Science, Social Studies, Economics	

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MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Use formulae by substituting values, solve formulae for other unknowns.	Algebra	Convert units, solve Ohm's Law problems, compute inductance, X_L (inductive and capacitive reactance), impedance. See Appendix Problems 7, 8, 9, 10, 11, 12, 13, 15, 17	Science, Economics	Basic Electricity - Marcus Appendix C has all formulas
Know value of pi	Geometry	Understand inductive reactance. See Appendix Problems 11, 12	Science	
Solve square root problems, use tables also	Algebra	Understand circuits containing resistance, inductance, and capacitance. See Appendix Problems 13, 15	Science	
Read a decimal equivalence chart and metric conversion chart	General Math	Convert units in problems.	Science	See Understanding Electronics, Buban and Schmidt Appendix 1 of Text
Positive and negative number addition	Algebra	Understand magnetic theory, exponents in scientific notation, graphs.	Science, Economics	

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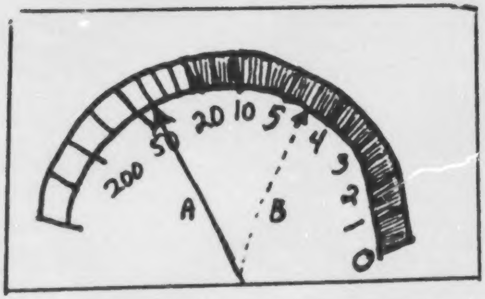
MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

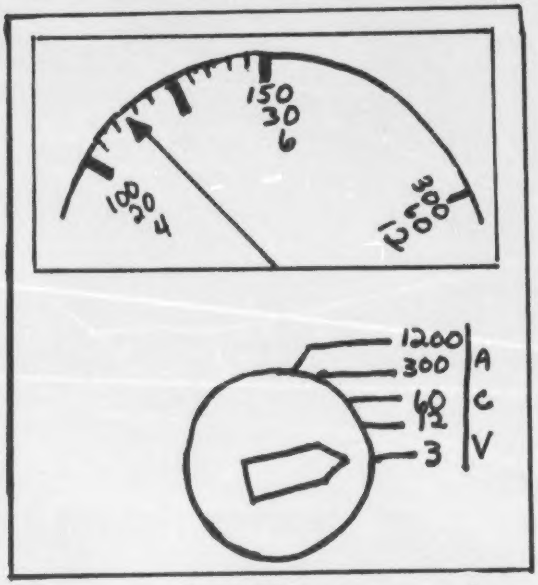
Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Laws of multiplying and dividing exponents	Algebra	Use scientific notation to aid in calculations. See Appendix Problem 16.	Science	



Example 1: What are the readings on the OHM scale of the VOM?

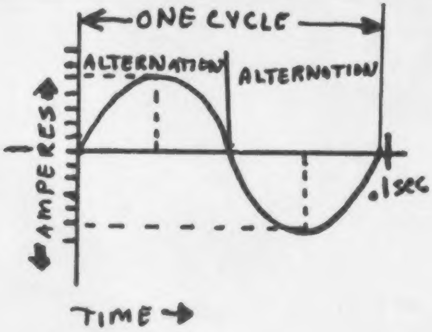
A.________

B.________



Example 2: Calculate the reading on the ac VOM scale.

Example 3: The prefix Milli- means________ and Kilo- means________. Mega- means__________ and Micro- means ________.



Example 4: Explain the diagram of the sine wave. What is the frequency of the figure shown?

Appendix

Example 5: Two magnets are positioned so the north pole of one is 2 inches from the south pole of the other. If they are moved so they are only 1/2 inch apart, how many times (greater/less) would their attraction be?
choose one

Example 6: A 100 - Ohm resistor has a tolerance of 5%. What is the allowable range?

Example 7: How much will it cost to run six 60-watt lamps five hours a day if the rate is $.0675 per kilowatt hour?

Example 8: What is the resistance of a conductor if 150 volts is needed to force 3 amperes of current through it?

Example 9: A. If P = IxE and E = IxR, express P in terms of I and R only.

B. What is the power if 2 amps flow through a conductor whose resistance is 5 Ohms?

Example 10: 470,000 Ω = ________ KΩ = __________ MΩ

Appendix

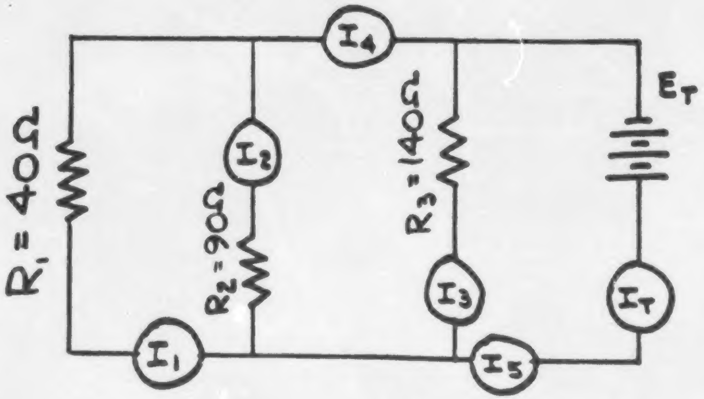
Example 11: What is the inductive reactance (X_L) of a coil of 3 henrys as a 60 cycle alternating current flows through it?

Example 12: What is the capacitive reactance of a 5 microfarad capacitor placed in a 600 cycle ac circuit?

Example 13: What is the total impedance of a series circuit with a resistor of 7 ohms and inductor with inductive reactance of 6 ohms?

Example 14: A microfarad (symbol____) is __________________ of a farad.

Example 15:



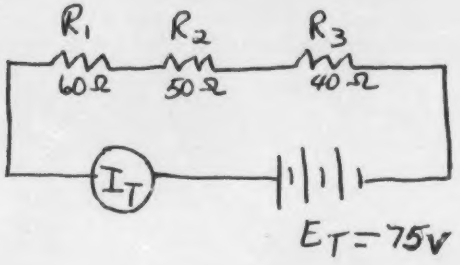
Parallel circuit
Calculate:

E_1 __________
E_2 __________
E_3 __________
I_1 __________
I_2 __________
I_3 __________
I_4 __________
I_5 __________
I_T __________
R_T __________

Example 16: Solve using powers of ten.

$$\frac{1000 \times 37000 \times .63}{37.70 \times 135000 \times .008}$$

Example 17:



Find:

E_1 __________ I_1 __________

E_2 __________ I_2 __________

E_3 __________ I_3 __________

I_T __________

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Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Read a scale	General Math	Read a VOM, voltmeter, transistor tester, oscilloscope. See Appendix Problems 1, 2.	Science	
Add, subtract, multiply, divide, round whole numbers, fractions, decimals.	General Math	Compute voltage on VOM, solving Ohm's Law, convert units, reactance problems, voltmeter, scientific notation. See Appendix Problems 2, 4, 7, 8, 10, 11, 12, 13, 15, 16, 17.	Science	
Understand metric prefixes, symbols, calculate in metric.	General Math	Recognize and convert units of power, See Appendix Problems 3, 7, 10, 14.	Physics	
Read a graph	General Math Algebra	Understand sinewave, alternators, charts, and electron tube curves. See Appendix Problems 4, 19.	Physics	
Proportion	General Math Algebra, Geometry	Understand magnetic attraction. See Appendix Problem 5.	Science	
Use percents.	General Math	Calculate tolerance range of a system, understand output and efficiency. See Appendix Problems 6, 18.	Science, Social Studies, Economics	
Use formulae by substituting values, solve formulae for other unknowns.	Algebra	Convert units, solve Ohm's Law problems, compute inductance, X_L (inductive and capacitive reactance), impedance, volt gain and drop. See Appendix Problems 7, 8, 9, 10, 11, 12, 13, 15, 17, 18, 19.	Science, Economics	Basic Electricity - Marcus Appendix C has all formulas.

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MATHEMATICS SUPPLEMENTAL GUIDE
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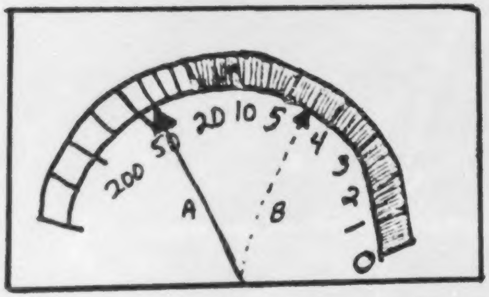
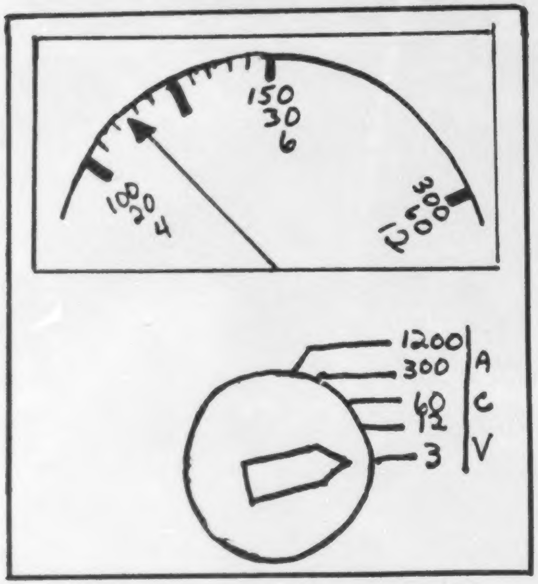
Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Know value of pi.	Geometry	Understand inductive reactance. See Appendix Problems 11, 12.	Science	
Solve square root problems, use tables also.	Algebra	Work circuits containing resistance, inductance, and capacitance. See Appendix Problems 13, 15.	Science	
Read a decimal equivalence hcart and metric conversion chart.	General Math	Convert units in problems.	Science	See *Understanding Electricity and Electronics*, Bubon & Schmidt Appendix 1 in text.
Postive and negative number addition.	Algebra	Understand magnetic theory, exponents in scientific notation, graphs.	Science, Economics	
Laws of multiplying and dividing exponents.	Algebra	Scientific notation, aid in calculations. See Appendix Problem 16	Science	
Understand and use log functions.	Algebra	Understand audio-frequency amplifiers.		



Example 1: What are the readings on the OHM scale of the VOM?

A.________

B.________



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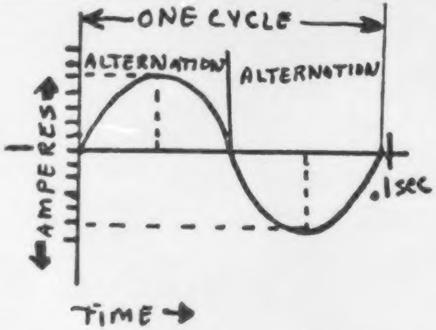

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Example 5: Two magnets are positioned so the north pole of one is 2 inches from the south pole of the other. If they are moved so they are only 1/2 inch apart, how many times (greater/less) would their attraction be?
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Example 6: A 100 - Ohm resistor has a tolerance of 5%. What is the allowable range?

Example 7: How much will it cost to run six 60-watt lamps five hours a day if the rate is $.0675 per kilowatt hour?

Example 8: What is the resistance of a conductor if 150 volts is needed to force 3 amperes of current through it?

Example 9: A. If P = IxE and E = IxR, express P in terms of I and R only.

B. What is the power if 2 amps flow through a conductor whose resistance is 5 Ohms?

Example 10: 470,000 Ω = ________ KΩ = __________ MΩ

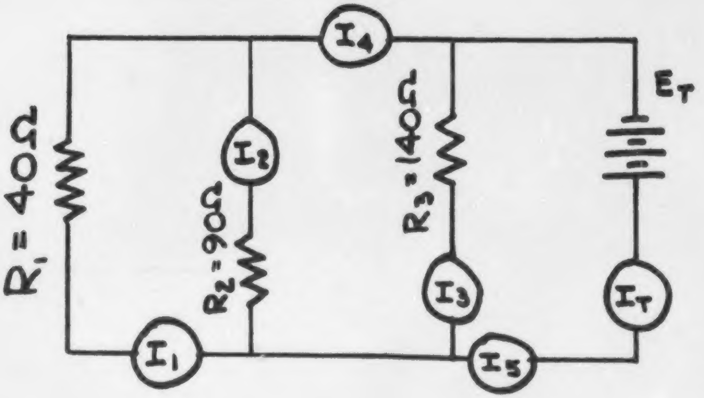
Appendix Example 11: What is the inductive reactance (X_L) of a coil of 3 henrys as a 60 cycle alternating current flows through it?

Example 12: What is the capacitive reactance of a 5 microfarad capacitor placed in a 600 cycle ac circuit?

Example 13: What is the total impedance of a series circuit with a resistor of 7 ohms and inductor with inductive reactance of 6 ohms?

Example 14: A microfarad (symbol____) is ________________ of a farad.

Example 15:



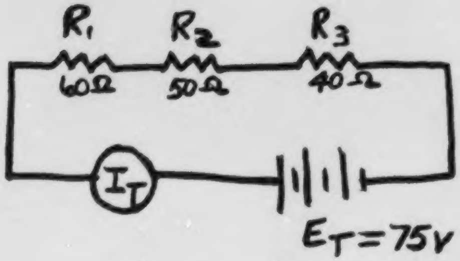
Parallel circuit
Calculate:

E_1 ________
E_2 ________
E_3 ________
I_1 ________
I_2 ________
I_3 ________
I_4 ________
I_5 ________
I_T ________
R_T ________

Example 16: Solve using powers of ten.

$$\frac{1000 \times 37000 \times .63}{37.70 \times 135000 \times .008}$$

Example 17:



Find:

E_1 ________ I_1 ________

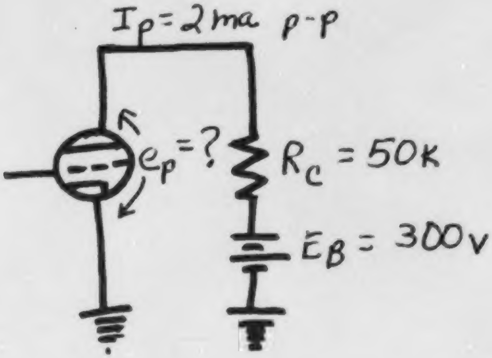
E_2 ________ I_2 ________

E_3 ________ I_3 ________

I_T ________

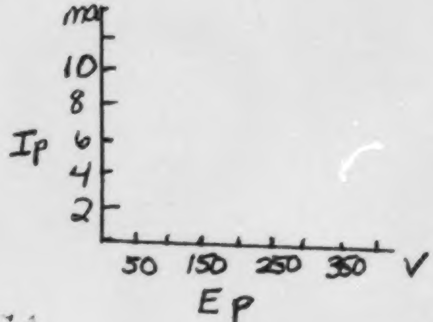
Example 18: 400 secondary watts are consumed by a 85% efficiency power transformer. It is connected to a 120 V AC line with primary resistance of 8 ohms. Find the primary current.

Example 19:



Ep = ____________ p-p volts

Draw a load line for this circuit.



Cluster COMMUNICATIONS

Occupation

Guide Engineering Drafting #9607

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 118 of

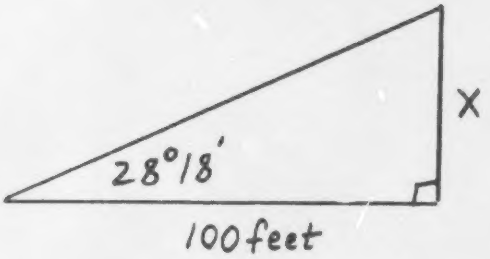
PLEASE REFER TO MECHANICAL DRAFTING I - 9604 and MACHINE DRAFTING 9605 for mathematical concepts that are duplicated in ENGINEERING DRAFTING.

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Logarithms and Trigonometry	Algebra-Trig	Use of logarithms, trigonometry and more advanced mathematical skills in engineering drafting	Teaching Architecture Engineering	See Appendix I
Vectors and their applications	Algebra-Trig	Vector applications in determining forces of engineering drafting	Education Architecture Engineering Professions	See Appendix II

APPENDIX I

Find the length of X:

A.

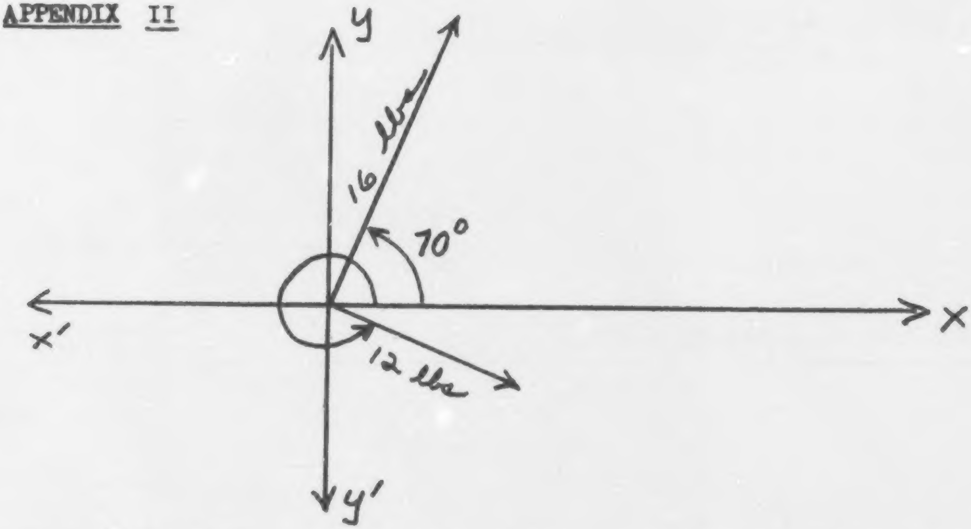


B. A bridge cable has a stress factor (in pounds) of:

$$S = (50.5)^4 \bullet \sqrt[5]{\frac{498.63}{(2^7)(.0035)}}$$

Find S using logarithms:

APPENDIX II



Find the magnitude and direction of the Resultant of two forces one 16 lbs. at 70° and the other 12 lbs. at 340°.

Cluster Communications

Occupation

Guide Graphic Arts I #9653

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 120 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Reading a ruler (nearest 1/16 inch	Basic Skills Senior Math	Measure from edge of frame to align paper below stencil for a screenprint See Appendix 10	Screen Printing I	
Read a Celsius thermometer	Basic Skills Senior Math	Some chemicals for developing photographs must be developed at a specific temperature See Appendix 9		
Ratios and Proportion	Basic Skills Senior Math	Developing chemicals for film must be mixed according to ratios - ie. 10 parts water to 1 part chemical See Appendix 7		
Conversions in liquid measurement (ounces <->cups <-> pt. <->qt <-> gal.)	Basic Skills Senior Math	Mixed developing chemicals are stored in multi-gallon containers. To mix chemicals in proper proportion you may add x cups to y gallons to make a 1:10 ratio. See Appendix 6		

Appendix 6

1 gallon is equivalent to 4 quarts

__________ gallons = 8 quarts

__________ gallons = 32 quarts

5 gallons = __________ quarts

1½ gallons = __________ quarts

1 quart is equivalent to 2 pints

2 quarts = __________ pints

10 pints = __________ quarts

5 pints = __________ quarts

__________ quarts = 24 pints

1 gallon = ____________ quarts = __________ pints

__________ gallons = 12 quarts = __________pints

Appendix 7

In making a contact print you must mix a developer. To dilute the developer properly you mix 2 parts water with 1 part developer. Fill in the blanks so the proper dilution will be obtained.

2 cups water to __________ cup developer

1 cup water to __________ cup developer

__________ cups water to 3 cups developer

__________ cups water to 4½ cups developer

Appendix 9

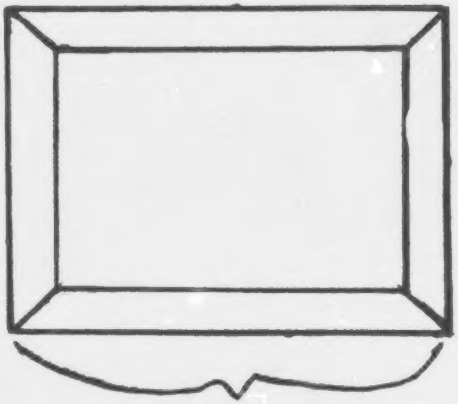
Get a thermometer from your teacher (either Celsius or Fahrenheit). What is the temperature of the air? ____________

Hold the bulb of the thermometer in your hand for 2 minutes. What is the temperature of your hand? ________________

Hold the thermometer in the drinking fountain for 2 minutes to determine the temperature of the drinking water. It is ________________

Appendix 10

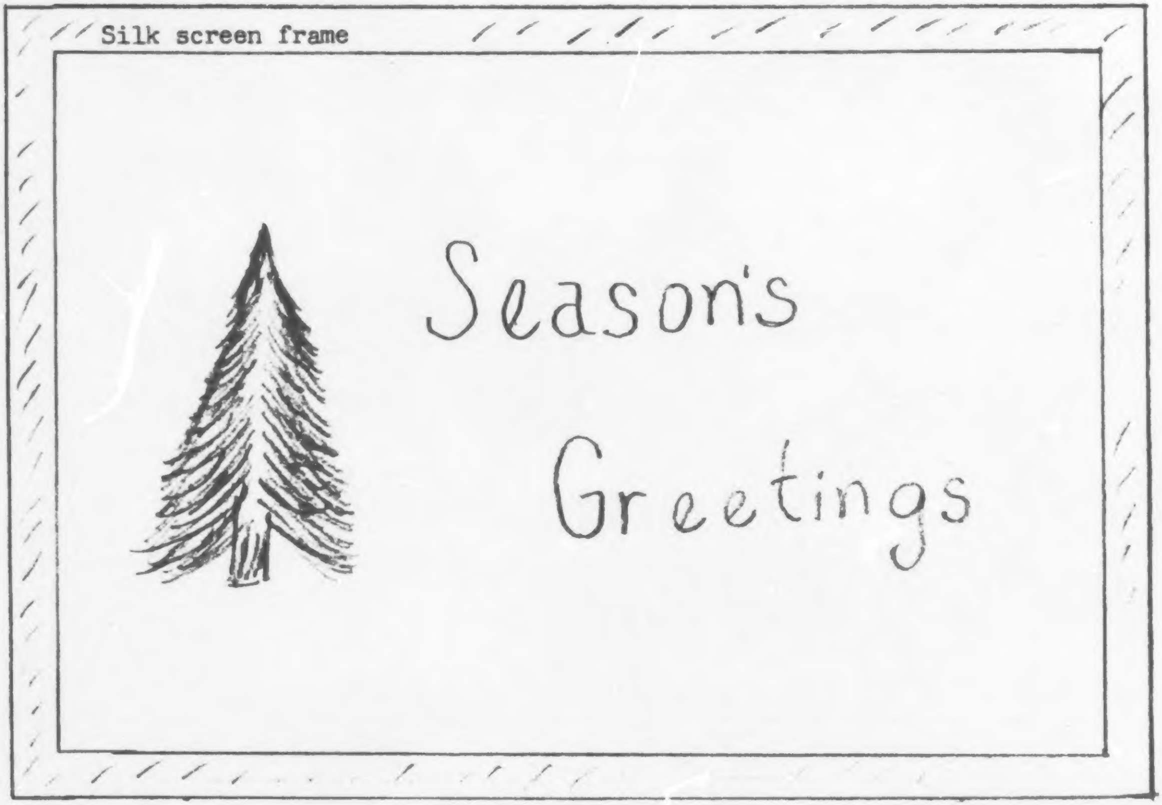
Measure the width of this picture frame. Find the midpoint and put an "X". Measure to the nearest 1/8 inch.



continued

Appendix 10 (Continued)

Essie is silk screening her Christmas cards this year. She wants the top of the tree to be $1\frac{1}{4}$" from the top of the card and the card centered. Draw in the outline of the correct placement of the Christmas card. The Christmas card is 4 inches high and 6 inches wide.



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Occupation

Guide Graphic Arts II #9654

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

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MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Systems of measure (English, metric, and specialized printing system)	General Math, Geometry	Measure size of page, size of type, number of ems, mix developing chemicals.	Science - See Appendx Problems 1, 2 3	
Add, subtract, multiply, divide whole numbers, decimals, fractions	General Math	Same as above	See Appendx Problems 1, 2, 3, 4, 6	
Substitute into a formula	Algebra or Pre-Algebra	Calculate the number of ems per page (see Notes A, B), crop photos, exposure time.	Science, Machine Shop, Electricity, Physics - See Appendix Probs. 3, 4, 6, 7	A. Length of line x 12 = ems per line B. Ems per line x number of lines = ems per page
Visualization of spatial change	Geometry	Set type. The four demons (p d b g)	Architecture - See Appendix Prob. 5	

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Guide Graphic Arts II - #9654

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

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MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Read a measuring dial.	General Math, Intuitive Geometry	Use machines on layout table, set a camera, timer	Science	
Read a table, graph	General Math, Business Math, Algebra, Geometry	Perform exposure - time calculations	Science, Social Studies	

Appendix

Example 1: With a line measure draw the outline of a page 24 x 36 picas; of one 7½ x 11½ inches.

Example 2: Complete these conversions:

____ leads = 1 slug ____ leads = 1 pica ____slugs = 1 pica

Example 3: Take a page of a book in the shop. List its title and page number you examine. Report the size of the page (in picas and in inches), the size of type used; and the number of ems on the page.

Example 4: How many ems of 8 point solid in a page 21 picas by 30 picas?

Example 5. Identify, in this order, the letters represented by these (as they appear in type):

g p j b

Example 6. Compute by formula and by diagonal-line method:

a. A 12" x 20" reduced to 4" width

b. Enlarge 300%, 10" x 12"

c. 6 picas wide, 6 inches high, enlarged 400%

d. 5" x 4" reduced to .75

Example 7: A photo 12" height is to be reduced to 8". Given the following basic information, compute needed changes in camera set-up and lighting: focal length 10½", best lens opening F/32, same size settings - lights 45°, 18" from center of copyboard; exposure 120 seconds.

Example 8: Make a chart showing basic camera set-up for same - size reproductions. (Include BE, CE, angle, distance of lights, f-number, length of exposure). Check your chart by setting up your camera by it.

Cluster Communications

Occupation

Guide Graphic Arts III #9655

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

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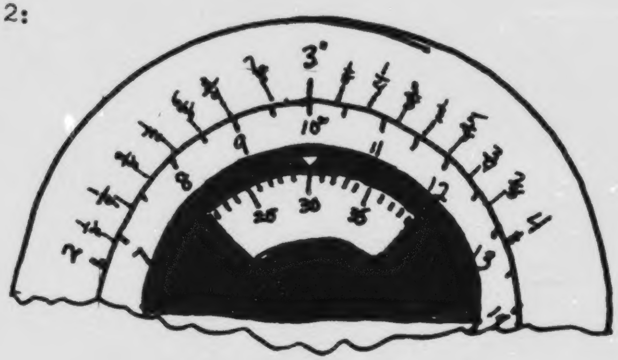
Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement in metric, English and printer's units	Taught in Graphic Arts I and II, General Math	Make layouts; set copyboard, lensboard.	Science - See Appendix Problem 1	
(NOTE: All skills listed in Graphic Arts II (9654) are presumed to be familiar to student.)				
Read a scale, use information selectively in problem solving.	General Math, Algebra, Geometry	Figure % enlargement on a proportional scale; use an exposure computer to figure exposures (also uses subtraction), figure humidity for paper storage.	Sciences, Laboratory and explorative classes, photography. See Appendix Probs. 2, 3, 4	
Squaring a number	Pre-algebra, Algebra	Compute new exposure time $\text{NET} = \left[\frac{(\text{CSR} + 1)}{2}\right]^2 \times \text{OET}$	See Appendix Problem 4	
Conversion of fractions, decimals, percentages	General Math	Measure layouts; reduce and enlarge photos, set up equipment, figure solutions		Use tables
Metric unit of volume	General Math	Although stock solutions are used in the shop, this would be a valuable skill when seeking employment		

Appendix

Example 1: Prepare camera copy for a ruled form, with hand-set type headings.

Rule the lines .7mm apart.

Example 2:



John used the scale to find the percent of reduction. He is reducing a picture 10 inches high to _____inches. The percent is ______%.

Example 3: Use the following basic information to figure exposure for halftones of a picture assigned: camera size 100%, f/11, developing time 180 seconds 68-70°F, basic flash exposure 25 seconds, basic density range 1.20.

Photo__________________
Shadow density__________________ (1)
Highlight density ______________ (2)
Copy Density Range ________________(1-2)
Copy Density Range ________________(3)
Camera basic density ______________(4)
EXCESS DENSITY ________________(3-4)
Main Exposure ________________(sec)
Flash Exposure ________________(sec)

Example 4: Reduce to 6 inches in depth a photograph measuring 11 inches in depth. Compute SR, CE, BE, NET.

Basic information (focal length - 16 in.; f/32; exposure time - 40 seconds; lights - 45°, 24 inches from center of copyboard)

Cluster Communications

Occupation

Guide Introduction to Drafting #9600

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

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MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Ratio and Proportion	General Math Geometry	Using ratio and proportion in drafting	Machinist Layout Pattern Maker Architecture	See Appendix 1
Spatial Relations in Drawings (Using congruency)	Geometry	Making single view drawings	Pattern Maker Designer Artist	See Appendix 2
Basic Constructions	Geometry	Constructions used in the drafting field	Sheet Metal Layout Technical Illustrator	See Appendix 3
Concept of Sizes	Basic Math Geometry	Making correct dimension figures	Architecture Contracting Design	See Appendix 4

COMMUNICATIONS APPENDIX

APPENDIX 1

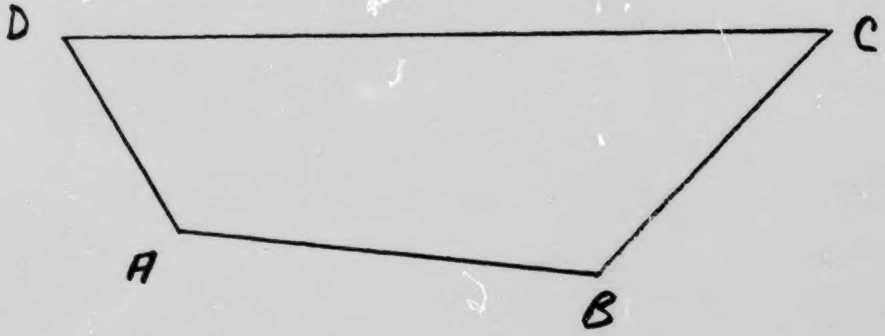
1. While making a scaled drawing a draftsperson uses the scale 3/4" = 1 foot. How long on the drawing would a side of a building be if its length is 80 feet?

2. The wing span of a jet plane is 56'. What will be the wing span of a model of this plane built to a scale of 1" = 8' - 0".

Span = ____________________

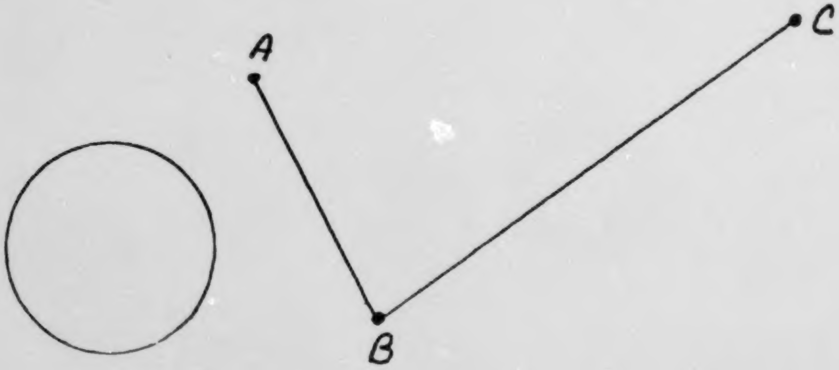
APPENDIX 2

1. Using a compass and straight edge only, draw a figure congruent to Figure ABCD.



APPENDIX 3

1. Find the center of the circle.
2. Bisect $\overline{AB}$
3. Bisect $\angle ABC$
4. Construct a line parallel to $\overline{AB}$ and tangent to the circle.
5. Construct a tangent to the circle that contains Point B.

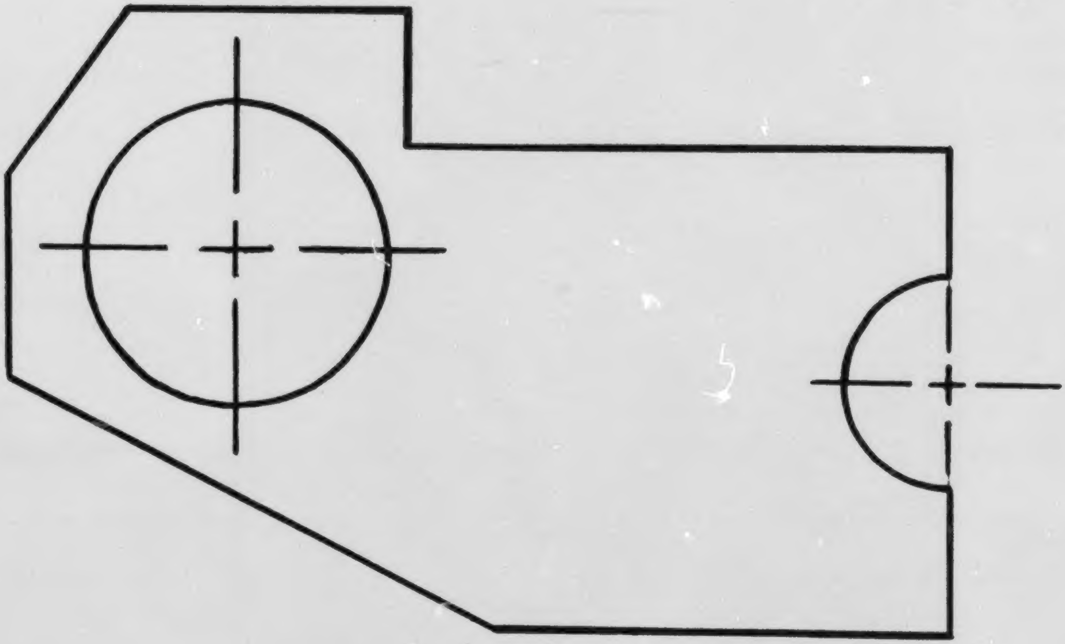


APPENDIX 4

Re-draw the figure below and correctly dimension it. Center your figure on an 8½" by 11" sheet.

Scale: Full Size

Measurements: To 1/16th of an inch and nearest degree.



Cluster **COMMUNICATION**

Occupation

Guide Machine Drafting #9605

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

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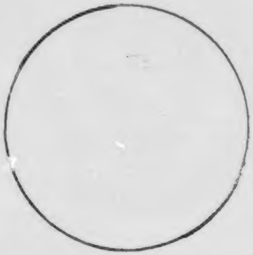
PLEASE REFER TO MECHANICAL DRAFTING I - 9604 FOR MATHEMATICAL CONCEPTS THAT ARE DUPLICATED IN MACHINE DRAFTING.

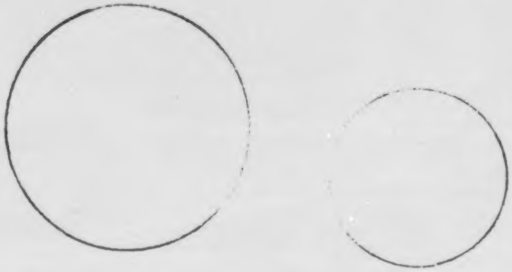
Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Use of the compass and protractor	Geometry	Constructions needed for proficiency in machine drafting	Art Patternmaking Pre-engineer Detailer	See Appendix I
Ratio and proportion Measurement	Geometry	Full size views from scaled drawings	Photography Art Patternmaker Engineer	See Appendix II
Loci and their applications	Geometry	Locus problems as they are applied to machines in drafting	Teaching Art Patternmaking Engineering	See Appendix III

APPENDIX I

A. Construct a regular pentagon using only a compass, straight edge and the given circle.



B. Construct a circle that is tangent to the two given circles.

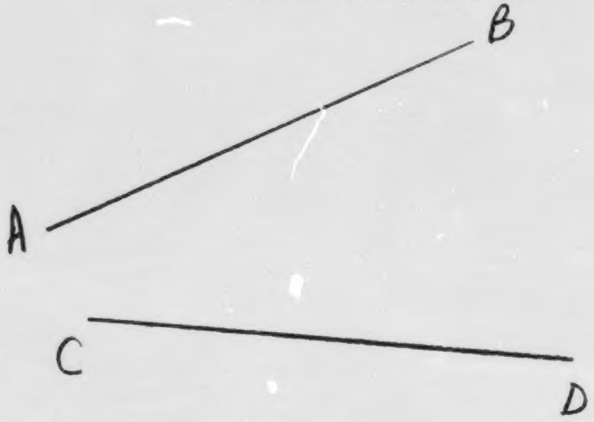


C. Construct a $22\frac{1}{2}^\circ$ angle without the use of a protractor.

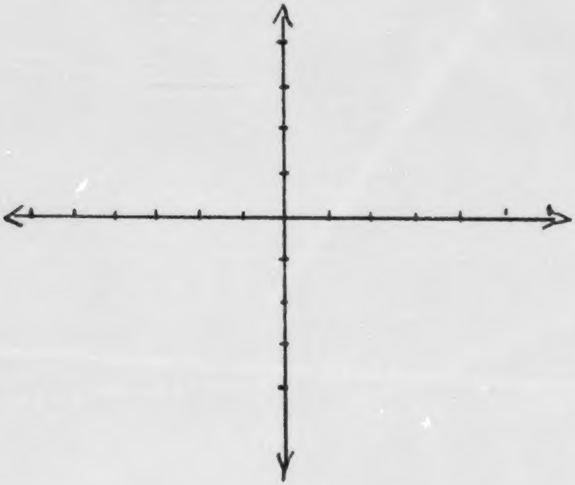
D. Divide segment AB into 5 equal parts.

Appendix I (Continued)

E. Construct a circle tangent to segment AB and CD.

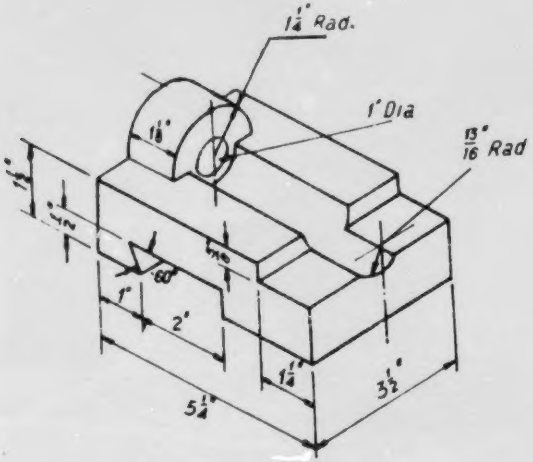


F. Construct an ellipse whose major axis is 12 and minor axis is 8.



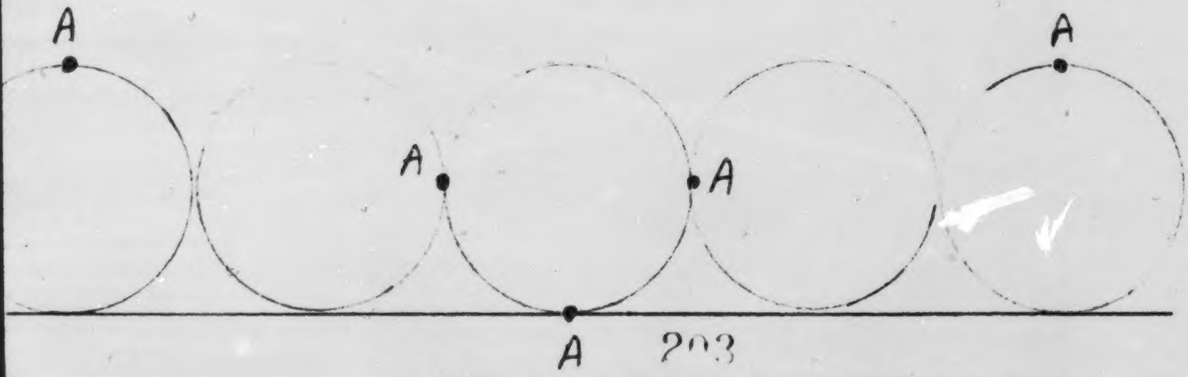
APPENDIX II

Draw full size the front elevation (view), end elevation (view), and plan of the details shown in the object below. Write the dimensions in each drawing.



APPENDIX III

Construct a cycloid starting with Circle O, Point A and Line ℓ.



Cluster Communications

Occupation ____________

Guide Machine Drafting II #9606

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

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MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Construction (bisect and trisect a line, given angle, divide an angle, triangle, hexagon, pentagon, octagon, polygon, circle constructions, conic sections, ellipse constructions, noncircular curve, cycloids, involute, spiral of Archimedes, helix)	Geometry	Make isometric drawings. See Appendix, Problems 1, 2, 3		See Engineering Drawing - French & Vierck. Pp 51-73 Machine Drafting and Related Technology - Yankee (These would be very helpful to get sample exercises from).
Angle measuring	Geometry	Do drawings with geometric work. See Appendix, Problem 4	Physics	
Decimal values	General Math	Understand tolerance of parts. Apply tolerances to fitting shaft to hole.	Science	
Conversion English to metric	General Math	Dual dimensioning patterns, converting foreign patterns, convert thread information, spring information. See Appendix, Problem 5	Science, Physics, Chemistry	
Understand English metric linear measure	General Math	Measuring lengths on pattern parts, bend allowances. See Appendix, Problems 1 - 8	Science	

Cluster Communications

Occupation

Guide Machine Drafting I #960

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

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MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Fractions and decimal equivalents, be able to use table also, know fractions, decimals, read decimal scale ruler.	General Math	Dimensioning drawings in decimals. See Appendix Problems 6,7	Science	
Proportion	Geometry, Algebra	Draw to scale; interpret drawings.	Science	
Substitution in a formula	Algebra	Finding bend allowance. See Appendix Problem 8	Physics	
Calculate volume in metric and English	Geometry	Calculate casting weight.		
Read a scale on a micrometer	Geometry	Measure with micrometer. See Appendix Problem 9.		
Use a calculator	Business, General Math	Estimate, calculate weight of castings.		
Round off decimals	General Math	Make a drawing where instructions are given to round off decimal measures. See Appendix Problem 10		

Appendix

Example 1: Draw a horizontal line 4½ in. long. Divide it into seven equal parts.

Example 2: Draw a regular hexagon, distance across flats 4 3/8 in.

Example 3: Fig. 3 shows a front view of a shim. Draw it full size (inches.).

Example 4: Fig. 4 - Interpret the tolerances shown.

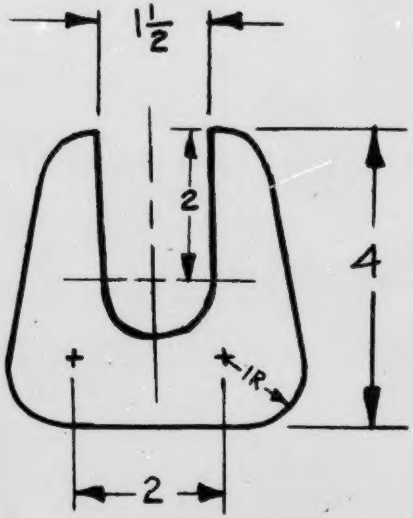
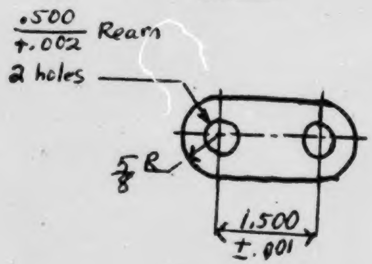


Fig. 3

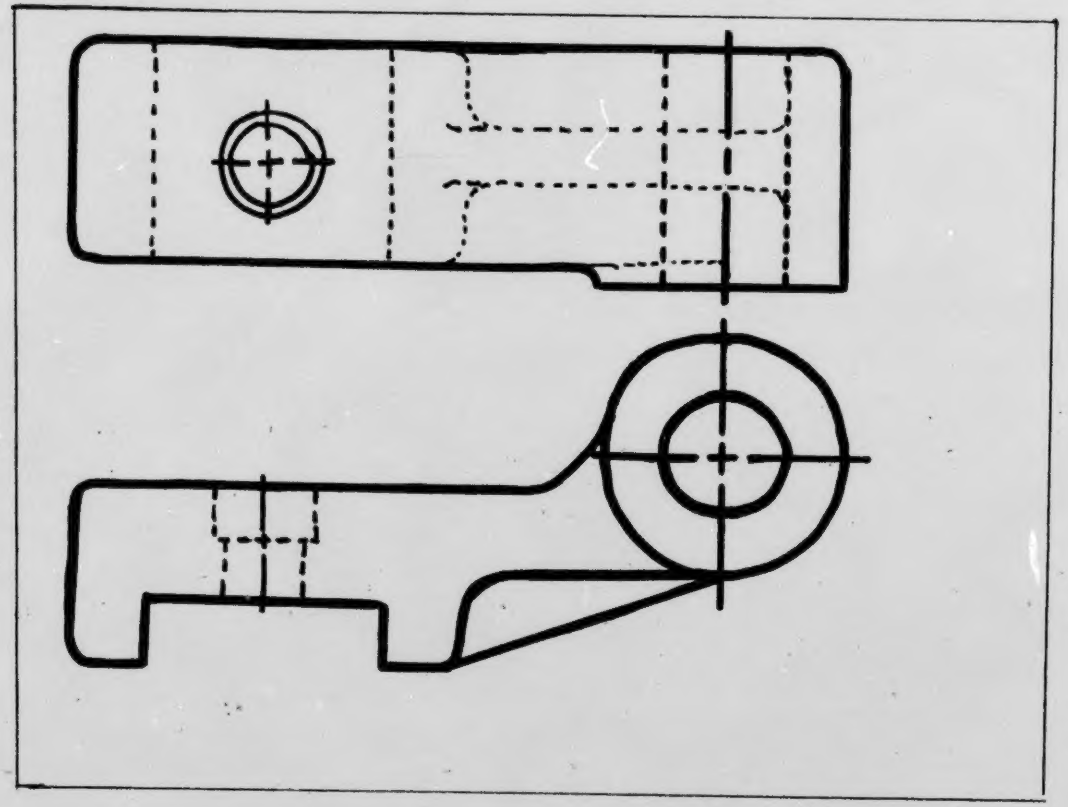
Fig. 4



Example 5: The shaft bracket in fig. 5 is shown half size. Dual measure it in both English and metric by converting your metric measures to English.

Example 6: Dimension fig. 6 (done quarter scale) in decimals.

Fig. 5



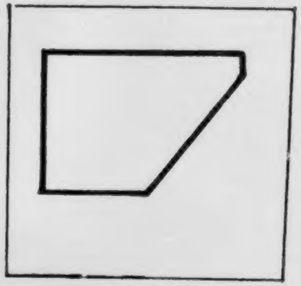
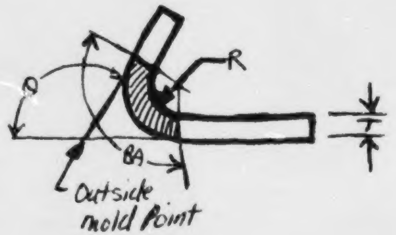


Fig. 6

Example 7: Convert these measures:

7 in = _______ cm   19 cm = ________ in   19 cm = _______ m

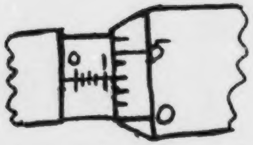
Example 8:



If θ is 108°, find the bend allowance using the formula R=4, T=2

$BA = (.01745R + .0078T)\,\theta$

Example 9:



What is the reading on the micrometer?

Example 10: Round to three decimal places:

2.9874 ~ ________   .00591 ~ ____________   1.00049 ~ _____________

Cluster COMMUNICATIONS

Occupation ______

Guide Mechanical Drafting I #9604

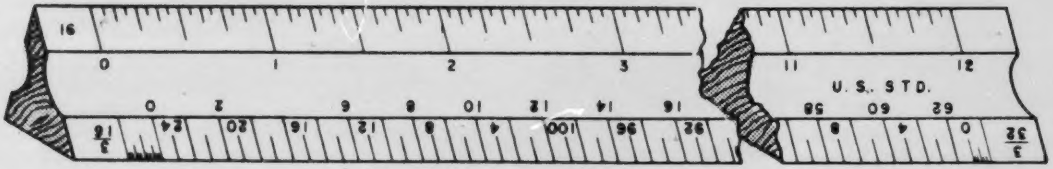
OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 144 of ____

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement	Basic Math Geometry	Dimensioning different views of a mechanical drawing	Detailer Layout Machinist Architecture	See Appendix I
Projections	Geometry	Projections as used in mechanical drafting	Patternmaking Machinist Engineering	See Appendix II
Special Triangles	Geometry Algebra-Trig	Use of 30-60-90 triangle and 45-45-90 triangle in drafting	Engineering Architecture Tracer	See Appendix III
Parallel Lines and Perspectives	Euclidean Geometry	Use of different types of drawings, e.g., oblique, perspective, pictorial, auxiliary, etc. in drafting	Engineer Designing Architecture	See Appendix IV

APPENDIX I



Architect's triangular boxwood scale.

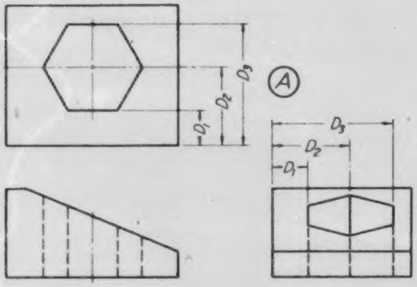
A. Referring to the Boxwood Scale above, how many 3/16" units are there in 1"? Any left over? (If yes, how long?)

B. Using a compass, transfer each segment to the scale pictured and measure it accurately to 1/16 ".

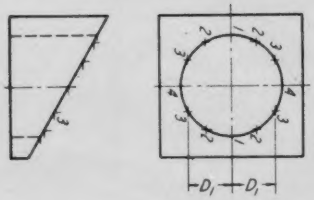
APPENDIX II

Study the figures below, then draw the 3rd projected view for B as you see in A.

1.

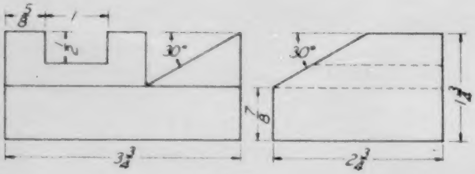


B

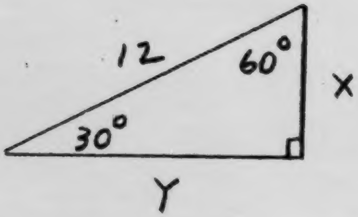


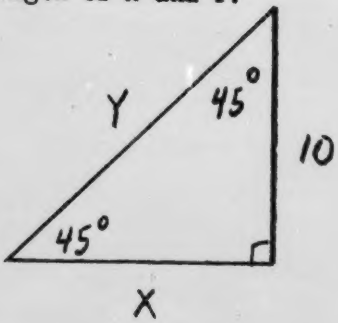
Appendix II (Continued)

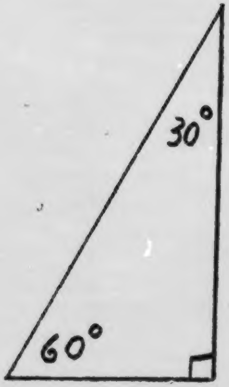
2. Given the front and side views of the figure below, add the top view.



APPENDIX III Find the length of X and Y.

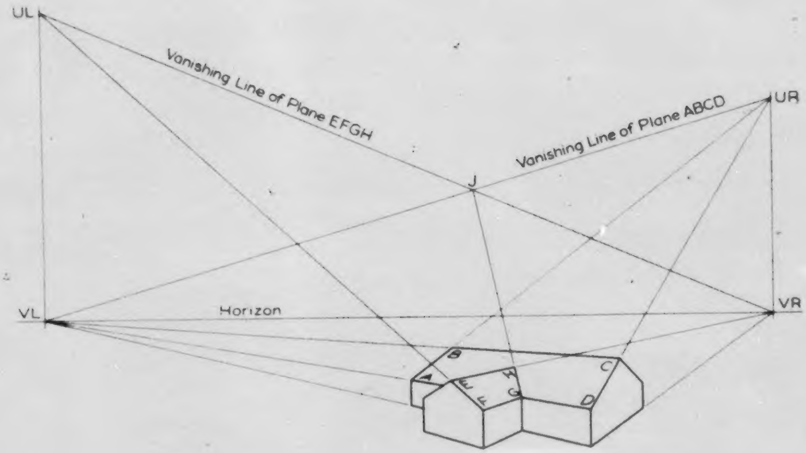






APPENDIX IV

The illustration below shows a house drawn in perspective.



Draw a simple cottage with porch, all in perspective (choose vanishing points).

Cluster COMMUNICATIONS

Occupation

Guide Mechanical Drafting II #9926

OCCUPATIONAL EDUCATION
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MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

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PLEASE REFER TO THE FOLLOWING SHEETS FOR MATHEMATICAL CONCEPTS THAT ARE DUPLICATED IN MECHANICAL DRAFTING II - 9926:

(1) Intro. to Drafting 9600
(2) Architectural Drafting 9600
(3) Mechanical Drafting I - 9601
(4) Machine Drafting 9605
(5) Engineering Drafting 9607
(6) Electrical Drafting 9608

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Fractions and Decimals	Sr. Math Algebra	Dimensions of threads and fasteners	Hardware Machinist Checker Detailer	See Appendix I, II
The Metric System	Sr. Math	Metric Dimensioning in Mechanical Drafting	Hardware Foreign Service Detailer Engineer	See Appendix III
Precision Measurement	Sr. Math Geometry	Precision measuring as applied to the drafting profession	Machinist Hardware Mechanic	See Appendix IV

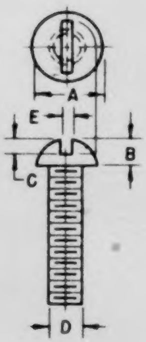
APPENDIX I

A. A number 3 National Fine Thread has 56 threads per inch but a number 3 National Course Thread has 48 threads per inch. What is the difference in threads per inch? What is the difference in total threads of 2 #3 N.F. and N.C. bolts if they are 3" in length?

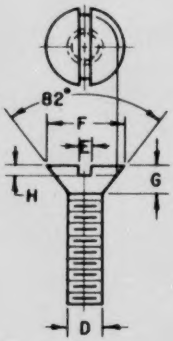
B. A Type B Set Screw has a 15.64 inch diameter. What is this as a 3-place decimal?

APPENDIX II

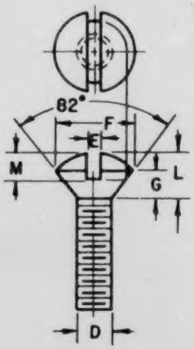
ROUND



FLAT



OVAL



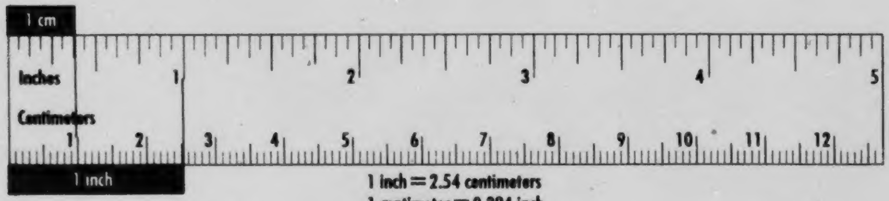
Dia	A	B	C	E	J	F	G	H
4—0.112	0.211	0.086	0.058	0.039	0.060	0.225	0.067	0.030

A. Redraw the flat head machine screw above listing the correct dimensions from the table above.

APPENDIX III

A. A bolt is 3½" in length. What is the length in centimeters? In millimeters?

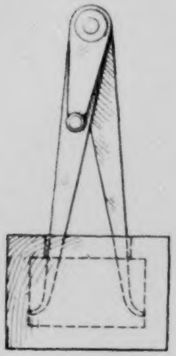
B. A draftsperson is using a scale 1" = 4'. Convert this scale to metric measures.

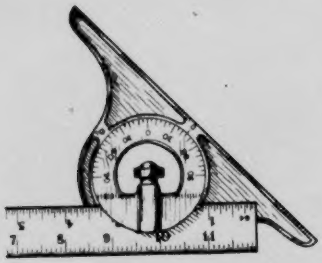


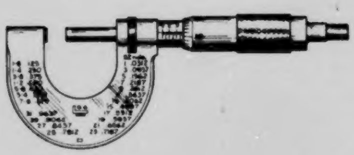
1 inch = 2.54 centimeters
1 centimeter = 0.394 inch

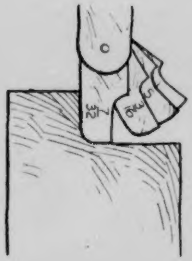
APPENDIX IV

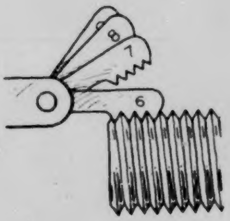
Name each of the following tools used for precision measurement.

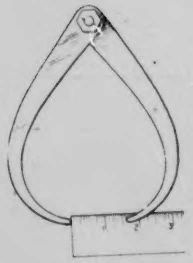












Cluster Communications

Occupation ____________

Guide Photography (Basic) #9656

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

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Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Comparison of Fractions	Basic Skills	Use varios shutter speeds on cameras - must know that 1/30 of a second is greater than 1/60 See Appendix 1		
Rounding off decimals	Basic Skills	Operate light meters - needs to be able to decide when the meter would read closer to 30m or 60 if 2 or 2.8 - See Appendix 2		
Read decimals (in charts and sliding scales)	Basic Skills	Being able to find the right exposure for an electronic flash - reading charts and sliding scales - See Appendix 3		
Multiplication Tables	Basic Skills	Making a test strip and choose correct exposure - test strip exposures are multiples of a certain length of time - See Appendix 4		

Appendix 1

Which fraction is largest?

1/8, 1/20, 1/12

Which is the longest period of time?

1/30 sec.. 1/20 sec., 1/60 sec.

Which is the shortest period of time?

3/10 sec., 4/5 sec., 10/40 sec.

Which fraction is smallest?

1/20, 1/50, 1/70

Appendix 2

Write if the decimal is closer to 2 or 2.8

2.1 - __________ 2.5 - ________

2.7 - __________ 2.4 - ________

Round off each decimal to the nearest tenth.

3.04 - __________ 13.337 __________ 5.96 - __________

5.173 - _________ 4.09 - _________ 1.85 - __________

Appendix 3

Hand-Held Meter

The ASA is set to the number recommended by the film manufacturer. The meter is pointed at the subject and the center dial turned until the needles overlapped. Now you can read the dial to choose the time and F-stop you want. The correct shutter speed (time) is above the corresponding F-stop (F1).

Example

F-stop of 1.4 correct speed is 1/1000
F-stop of 11 correct speed is 1/15.

Use the above picture to find the shutter speed (time) for the following F-stops (F1)

F-stop	Shutter speed
4	____________
16	____________
2	____________
5.6	____________

Appendix 4

1. Fill in the blanks to complete each pattern.

_____, 15, 20, 25, _____, _____, _____.

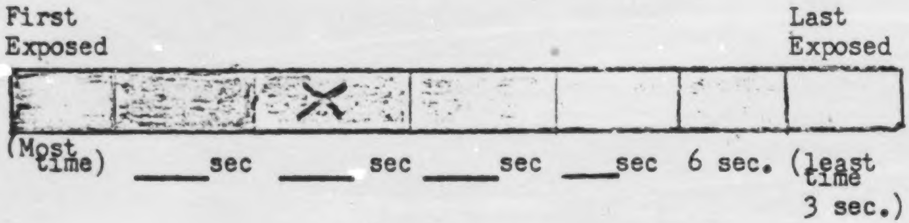
12, 15, _____, 21, _____, _____, _____.

90, 80, _____, _____, 50, _____, _____, _____, _____.

72, 70, _____, _____, 64, _____, _____.

2. To find out how long film needs to be developed to get a good picture a TEST STRIP is made. A TEST STRIP is made by exposing successive sections of the test paper for a fixed amount of time. A TEST STRIP was made tieh each successive section being exposed for an additional 3 seconds.

TEST STRIP



Fill in the blanks to show how long each section was exposed. The best exposure time turned out to be the section with the "X" on it. How long was that section exposed? __________

Cluster Communications

Occupation

Guide Photography I #9666

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Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Comparison of Fractions	Basic Skills	Shutter speeds are expressed as fractions. Student needs to know that 1/30 of a second is a greater amount of time than 1/60 of a second. See Appendix 1		
Rounding off Decimals	Basic Skills	In reading a light meter the indicator is often between two decimals. Student must be able to decide which number the indicator is closest to. See Appendix 2		
Reading Decimals	Basic Skills	Numbers used to compute exposure on an electronic flash are in decimal form. See Appendix 5		
Reading Charts and Sliding Scales	Basic Skills Senior Math	Find the proper exposure (with a flash a chart must be read). See Appendix 3		
Converting gallons to quarts to pints	Basic Skills	Mix chemicals for darkroom use. See Appendix 6		The directions may ask for a ratio of 10:1 (water to chemical). You will use 5 gallons of water. How many quarts of chemicals are needed?

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Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Ratio	Basic Skills Senior Math	Mix chemicals according to ratios ie. 3:1, water:chemical See Appendix 7		
Skip Counting/or multiplication	Basic Skills	Make a test strip to find the correct exposure time, in multiples of a whole number. See Appendix 4		

Appendix 1

Which fraction is largest?

1/8, 1/20, 1/12

Which is the longest period of time?

1/30 sec.. 1/20 sec., 1/60 sec.

Which is the shortest period of time?

3/10 sec., 4/5 sec., 10/40 sec.

Which fraction is smallest?

1/20, 1/50, 1/70

Appendix 2

Write if the decimal is closer to 2 or 2.8

2.1 - ________ 2.5 - ________

2.7 - ________ 2.4 - ________

Round off each decimal to the nearest tenth.

3.04 - ________ 13.337 ________ 5.96 - ________

5.173 - ________ 4.09 - ________ 1.85 - ________

Appendix 3

Hand-Held Meter

The ASA is set to the number recommended by the film manufacturer. The meter is pointed at the subject and the center dial turned until the needles overlapped. Now you can read the dial to choose the time and F-stop you want. The correct shutter speed (time) is above the corresponding F-stop (F1).

Example

F-stop of 1.4 correct speed is 1/1000
F-stop of 11 correct speed is 1/15.

Use the above picture to find the shutter speed (time) for the following F-stops (F1)

F-stop	Shutter speed
4	
16	
2	
5.6	

Appendix 4

1. Fill in the blanks to complete each pattern.

____, 15, 20, 25, ____, ____, ____.

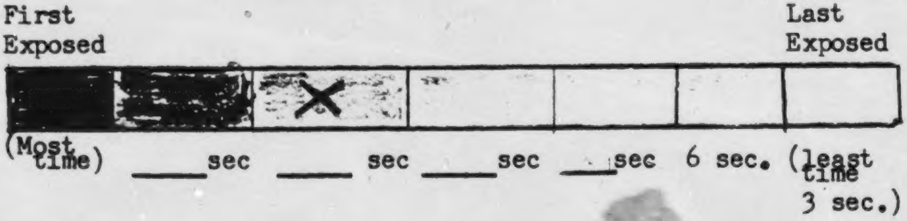
12, 15, ____, 21, ____, ____, ____.

90, 80, ____, ____, 50, ____, ____, ____, ____.

72, 70, ____, ____, 64, ____, ____.

2. To find out how long film needs to be developed to get a good picture a TEST STRIP is made. A TEST STRIP is made by exposing successive sections of the test paper for a fixed amount of time. A TEST STRIP was made tieh each successive section being exposed for an additional 3 seconds.

TEST STRIP



Fill in the blanks to show how long each section was exposed. The best exposure time turned out to be the section with the "X" on it. How long was that section exposed? ____________

Appendix 5

Match the numbers with the correct words

__________1.) 5.3

__________2.) 53

__________3.) .53

__________4.) 53.0

__________5.) 0.53

A. fifty-three

B. five and three tenths

C. fifty-three hundredths

Write how you would say these numbers.

2.3 is read two and three tenths.

4.07 is read ______________________________.

.32 is read ______________________________.

1.8 is read ______________________________.

3.156 is read ______________________________.

0.001 is read ______________________________.

Appendix 6

1 gallon is equivalent to 4 quarts

__________ gallons = 8 quarts

__________ gallons = 32 quarts

5 gallons = _________ quarts

1½ gallons = ________ quarts

1 quart is equivalent to 2 pints

2 quarts = __________ pints

10 pints = __________ quarts

5 pints = ___________ quarts

__________ quarts = 24 pints

1 gallon = _____________ quarts = _____________ pints

__________ gallons = 12 quarts = ___________pints

Appendix 7

In making a contact print you must mix a developer. To dilute the developer properly you mix 2 parts water with 1 part developer. Fill in the blanks so the proper dilution will be obtained.

2 cups water to __________ cup developer

1 cup water to __________ cup developer

__________ cups water to 3 cups developer

__________ cups water to 4½ cups developer

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Occupation

Guide Photography II #9667

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MATHEMATICS SUPPLEMENTAL GUIDE
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Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Add, Subtract, Multiply, and Divide Decimals	Basic Skills	When more than one filter is used on a camera computations with decimals are used to find proper adjustment of exposure. See Appendix IV		
Reading Charts and Tables	Basic Skills Senior Math	Find the proper exposure when using a flash. See Appendix I		A chart is read using the given distance to find proper F-stop.
Reading Decimals	Basic Skills	When computing exposure the F-stop scale is in decimal form. See Appendix II		
Reading Fahrenheit Thermometer	Basic Skills	Mix film developer with the water so that it must be within a certain temperature range. See Appendix V		
Measure Ounces, Quarts, Gallons	Basic Skills	Mixing processing chemicals involves measuring. See Appendix III		

Appendix I

Hand-Held Meter

The ASA is set to the number recommended by the film manufacturer. The meter is pointed at the subject and the center dial turned until the needles overlapped. Now you can read the dial to choose the time and F-stop you want. The correct shutter speed (time) is above the corresponding F-stop (F1).

Example

F-stop of 1.4 correct speed is 1/1000
F-stop of 11 correct speed is 1/15.

Use the above picture to find the shutter speed (time) for the following F-stops (F1)

F-stop	Shutter speed
4	__________
16	__________
2	__________
5.6	__________

Appendix II

Match the numbers with the correct words

________1.) 5.3

________2.) 53

________3.) .53

________4.) 53.0

________5.) 0.53

A. fifty-three

B. five and three tenths

C. fifty-three hundredths

Write how you would say these numbers.

2.3 is read two and three tenths.

4.07 is read ______________________________.

.32 is read ______________________________.

1.8 is read ______________________________.

3.156 is read ______________________________.

0.001 is read ______________________________.

Appendix III

1 gallon is equivalent to 4 quarts

________ gallons = 8 quarts

________ gallons = 32 quarts

5 gallons = ________ quarts

1½ gallons = ________ quarts

1 quart is equivalent to 2 pints

2 quarts = ________ pints

10 pints = ________ quarts

5 pints = ________ quarts

________ quarts = 24 pints

1 gallon = ________ quarts = ________ pints

________ gallons = 12 quarts = ________ pints

Appendix IV

$$\begin{array}{r} 8.32 \\ \underline{-1.07} \end{array}$$

$$\begin{array}{r} 4.3 \\ \underline{\times\ .8} \end{array}$$

$43.7 - 3.45 =$

$6 + 4.2 = 3.13 =$

$4.3 + 4.057 =$

$$\begin{array}{r} 67.04 \\ \underline{\times\ 3.1} \end{array}$$

$$\begin{array}{r} 4.6 \\ 8.07 \\ 23. \\ \underline{+\ 9.543} \end{array}$$

$$\begin{array}{r} 46.057 \\ \underline{-\ 8.426} \end{array}$$

$$2.3\overline{)5.75}$$

Appendix V

Get a thermometer from your teacher (either Celsius or Fahrenheit). What is the temperature of the air? ______________

Hold the bulb of the thermometer in your hand for 2 minutes. What is the temperature of your hand? ____________________

Hold the thermometer in the drinking fountain for 2 minutes to determine the temperature of the drinking water. It is ___________________

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Occupation

Guide Radio and Sound Equipment Repair I
9630

OCCUPATIONAL EDUCATION
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MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

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Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Basic operations of addition, subtraction, multiplication and division of rational numbers	General Math Math Concepts Discovery Math Senior Math Algebra I	Measurement of materials. Use of tools and electronic instruments. Calculations used in electronic formulas. Positive and negative numbers used in formulas involving direct and alternating current.		
Comparison of fractions Ratios and percents	General Math Math Concepts Discovery Math Senior Math	Choose the correct size of drills, nuts and bolts, screws. Choosing the correct calibration of testing instruments See Appendix I		
Ratios and proportion in solving equations	Math Concepts Senior Math Discovery Math Algebra I Geometry I	Used in calculations in Ohms Law and Watts Law formulas. Frequency modulation index. Power efficiency, audio amplifier stage gain Transformer turn ratios. See Appendix II		
Reciprocals	General Math Math Concepts Discovery Math Senior Math	Use in formulas involving parallel circuits. Finding total resistance. See Appendix III		
Exponents	General Math Math Concepts Discovery Math Senior Math Algebra I Geometry I	Used in power formulas in both direct and alternating current dircuits. Ohms Law modified for alternating current. Determine power lag or power lead See Appendix IV		

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INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

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Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Irrational numbers	Math Concepts Senior Math Discovery Math Algebra I Geometry Advanced Algebra	Used in power formulas and formulas dealing with alternating current See Appendix V		
Converting common fractions to decimal fractions	General Math Math Concepts Discovery Math Senior Math	Determine total resistance in a parallel electrical circuit See Appendix VI		
Powers of ten	General Math Math Concepts Discovery Math Senior Math	Study of elementary chemistry theory and electron flow See Appendix VII		
Metric system of measurement	General Math Math Concepts Discovery Math Senior Math	Change from smaller to larger and from larger to smaller electrical units See Appendix VIII		
Points, lines, planes and angles	General Math Math Concepts Discovery Math Senior Math Geometry	Drawing electrical circuits		

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MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

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Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Geometric polygons and circles	General Math Math Concepts Discovery Math Senior Math Geometry	Drawing electrical circuits		
Line Graphs	Math Concepts Discovery Math Senior Math Algebra I Advanced Algebra Trigonometry	Used to show relationships between circuit components See Appendix IX		
Trigonometric functions	Algebra I Discovery Math Geometry I Advanced Algebra Trigonometry Math Analysis	Ohms and Watts Law modified for alternating current. Radiation pattern of antenna See Appendix X		
Reading a number line	General Math Math Concepts Senior Math Discovery Math	Reading testing meters. Measuring length of wire See Appendix XI		
Logarithms	Advanced Algebra Trigonometry Math Analysis	Formulas for power gain in decibels See Appendix XII		

Example 1 Put the following in order from smallest to largest

$\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{5}{6}$, $\frac{3}{4}$

Example 2 Put the following in order from largest to smallest

.5; .065; .123; .83; .09

Example 3 Which is larger, the fraction in (a) or the fraction in (b)

(a) 3/8 (b) 3/6
(a) 2/5 (b) 4/7
(a) 3/4 (b) 5/9
(a) 7/8 (b) 7/9

Example 4 Place the following drill bit sizes in order from smallest to largest

1/2; 7/32; 21/64; 3/4; 16/64; 13/32

Example 1 In Watts formula $W = I \cdot E$ find W if $I = 24$ amps; $E = 9$ volts

Example 2 Solve for C

$$\frac{13.2}{.4} = \frac{C}{.3}$$

Example 3 Effieciency (in %) = $\frac{\text{Output}}{\text{Input}} \times 100$. Find the effieciency of an antenna if the output is 73 and the input is 75.

Example 4 Solve for R_T in the formula

$$R_T = \frac{1}{r_1} + \frac{1}{r_2}$$

if $r_1 = 4$; $r_2 = 6$

Example 5 In the formula for Impedence $Z = \frac{E}{I}$

find E in volts if $Z = 17$; $I = 6$

Example 1 Change the following to their reciprocals

(a) 1/3

(b) 8

(c) 8/3

(d) 9/11

(e) $4\frac{1}{2}$

(f) .7

Example 2 $\frac{1}{N} = \frac{4}{9}$

N = ____________

Example 3 $\frac{1}{R} = \frac{1}{2} + \frac{3}{4}$

Find R

Example 4 $\frac{1}{R_T} = \frac{1}{3} + \frac{1}{7} + \frac{1}{12}$

Change each fraction to its decimal equivalent to the nearest hundredth and then find R.

Example 1 (a) $2^3 =$ ____________

(b) $4^2 =$ ____________

(c) $3^4 =$ ____________

(d) The factors of r^3 are ____________________

Example 2 Using the formula for power $W = I^2R$
find W when $I = 1.2$ and $R = 4$

Example 3 Using the formula for power $W = I^2R$ find
R when $W = 142.1$; $I = 3$

Example 4 In the power factor formula Power factor $= \frac{W}{I^2Z}$
find the power factor if $W = 148$ watts; $I = 4$ amps; $Z = 5$ ohms

Example 5 Using the formula $R = \frac{E^2}{W}$
solve for W if $E = 9$ volts; $R = 3$ ohms

Example 1 (a) $\sqrt{49}$ = ____________

(b) $\sqrt{169}$ = ____________

Example 2 $\sqrt{411}$ is between what two whole numbers

Example 3 Using the formula $I = \sqrt{\frac{W}{R}}$
find I if W = 243 watts; R = 3 ohms

Example 4 Using the formula $R = \frac{E^2}{W}$
solve for E when R = 3 ohms; W = 27 watts

Example 5 In an alternating current circuit $R = \sqrt{Z^2 - x^2}$
where the impedence Z = 6 ohms and the reactance x = 3 ohms. Find the resistance R.

Example 1 Change the following to a decimal fraction to the nearest thousandth

(a) 1/4

(b) 2/3

(c) 5/7

Example 2

$$\frac{1}{R} = \frac{1}{2} + \frac{1}{4} + \frac{2}{3}$$

Change each fraction to its decimal equivalent to the nearest hundredth then solve for R.

Example 1 Express in scientific notation

(a) 2,300,000

(b) 19,000,000

(c) .0014

(d) .16

(e) .00000046

Example 2 Express in ordinary place notation

(a) The diameter of the sun, about 8.6×10^5

(b) In an electron tube germanium atoms outnumber indium atoms 10^8 to 1

(c) Resistivity of copper is 1.7×10^{-6} ohm centimeters.

Example 1 (a) To change from units to kilounits you would multiply by ____________

(b) To change from milli units to units you will ______________ by 1000.

(c) To change from milli units to kilo units you would ______________ by 10^6

Example 2 (a) One milliampere = __________ amperes

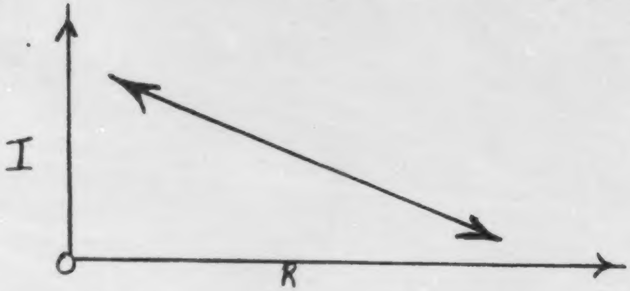
(b) One kilowatt = ___________ watts

(c) One megahertz = ___________ hertz

Appendix IX

Radio and Sound Equipment Repair I

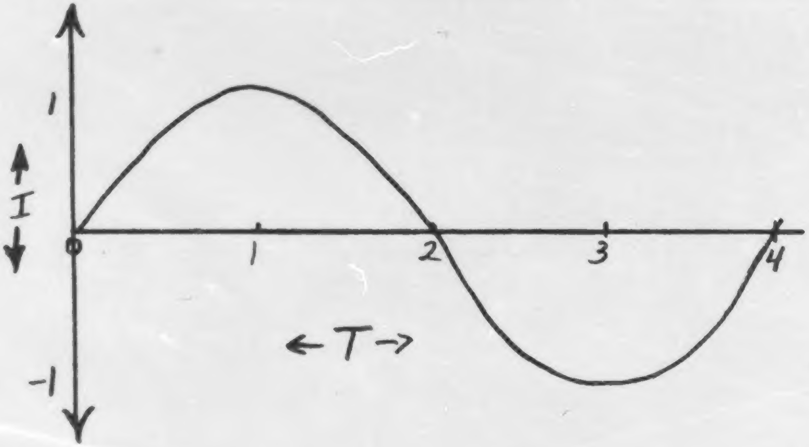
Example 1



(a) When I decreases R ____________

(b) When R decreases I ____________

Example 2



(a) At what point of T did I reverse its direction

(b) At what point of T is I a maximum

Example 1 In alternating current formula for Impedence $Z = \frac{W}{I^2 \cos\theta}$

$W = 480$ watts; $I = 6$ amps and $\theta = 0^\circ$ lag

Find Z

Example 2 (a) In alternating current formula $E = \sqrt{\frac{W Z}{\cos \theta}}$

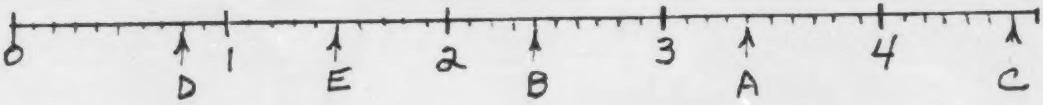
find E when $W = 9$ watts; $Z = 16$ ohms; θ (lag) $= 0^\circ$

(b) Could θ be a 90° lag

Appendix XI

Radio and Sound Equipment Repair I

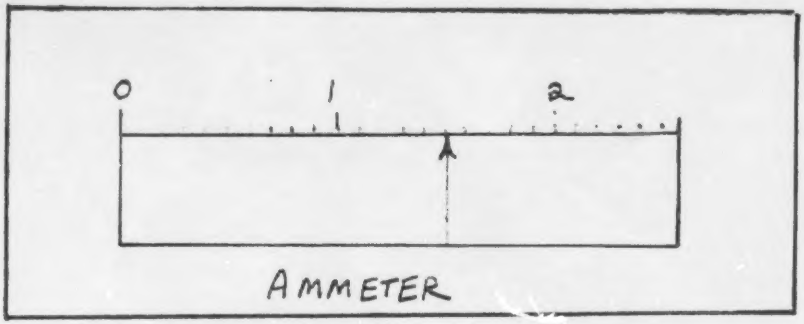
Example 1



Read to the nearest tenth the following on the number line above

A______ B ______ C ______ D ______ E ______

Example 2



To the nearest tenth how many amperes does this ammeter register

Example 1

(a) $\log_{10} 1000 =$ ____________________

(b) $\log_{10} 10 =$ ______________________

(c) $\log_{10} 1{,}000{,}000$ _________________

Example 2

If $\log_{10} 2 = .3010$ and

$\log_{10} 3 = .4771$ then

$\log_{10} 6 =$ ________________________

Example 3

Power gain formula measured in decibels (dB) is

$$dB = 10 \log \frac{P_1}{P_2}$$

$P_1 = 14; \quad P_2 = 7$

Find dB

Cluster Communications

Occupation

Guide Radio Program Production (Advanced) #9637

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 183 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Large numbers written both in words and in digit form	Math Concepts General Math Senior Math	Read statistical reports in news items and commercials See Appendix I		
Read very small numbers	General Math Math Concepts Senior Math	Read scientific reports in news items and commercials See Appendix II		
Decimal place values	General Math Math Concepts Senior Math	Read news items and commercials See Appendix II		
Rational and irrational numbers	General Math Math Concepts Senior Math	Read news items and commercials See Appendix I, II		
Math symbols and language	General Math Math Concepts Senior Math Algebra I Geometry Trigonometry Analysis	Give scientific reports which involve equations and inequalities See Appendix III		

Cluster Communications

Occupation

Guide Radio Program Production (Advanced) #9637

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 184 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement tell time in hours, minutes and seconds	General Math Math Concepts Senior Math Discovery Math	Schedule program time in hours, minutes and seconds. Add and subtract using base 60. See Appendix IV		
Metric measuring system	General Math Math Concepts Senior Math Discovery Math	Read weather reports using Fahrenheit and Celsius scale See Appendix V		
Ratios and Percents	General Math Math Concepts Senior Math Discovery Math	Read statistical data in news and commercials. See Appendix VI		
Equations	General Math Math Concepts Discovery Math Senior Math Algebra I	Evaluate simple equations dealing with converting units and radio operation See Appendix V		

Appendix I

Example 1 Read the following numbers

(a) 2,769,114
(b) 87,000,071
(c) 7,009,423,366
(d) 211,097,007,125

Appendix II

Example 1 Read the following decimal fractions

(a) .7
(b) .008
(c) .1206
(d) .0067894
(e) .0000002

Example 2 Read the following decimal fractions

(a) 8.463
(b) .942
(c) 769.0004
(d) 4.30028

Appendix III

Advanced Radio Program Production

Example 1 Read the following mathematical symbols and statements.

(a) $=$, $>$, $\neq$, $<$

(b) $40^{\circ}C$, $68^{\circ}F$

(c) $3n^3 > 6$

(d) $\sqrt{x^2 + y^2} = r$

(e) $E = m \cdot c^2$

(f) $\pi \cdot D = C$; $\pi = 3.14159$

Appendix IV

Example 1 What is the total time needed to broadcast the following on a radio station

News Headlines - 60 seconds
Commercial - 1 minute 15 seconds
News - 5 minutes 55 seconds
Commercial - 30 seconds
Music - 3 minutes 15 seconds
Public service announcement - 20 seconds
Music - 3 minutes 15 seconds
Commercial - 1 minute

Example 2 If a station went on the air at 7:00:00 A.M. and off the air at 1:05:00 A.M., how long was it on the air?

Example 3 A commercial went on the air at 9:13:02 and ended at 9:14:26. How long was the commercial?

Example 4 If an announcer can speak at the rate of 200 words per minute, how much time will he need for a 260 word commercial?

Appendix V Advanced Radio Program Production

Example 1 Convert the following

1 meter = ______________ centimeter
1000 meters = ___________ kilometers
1 liter = ______________ milliliters
1 kilogram = ___________ grams
1 kilogram = ___________ pounds

Example 2 Using the following formula $C = \frac{5}{9}(F - 32)$ convert Fahrenheit temperature to Celsius temperature when $F = 77^\circ$.

Appendix VI

Example 1 A baseball player is hitting .250. How many hits does he get in 20 times at bat?

Example 2 Detroit has won 40 out of the 60 games they have played. What per cent of their games have they won?

Example 3 Ten out of thirty car accidents leads to a fatality. What is the ratio of fatal car accidents?

Cluster Communications

Occupation ______

Guide Radio Programming and Announcing I 9638

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 188 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Reading large numbers written in both words and digit form	General Math Math Concepts Discovery Math Senior Math	Reading statistical reports in news items and commercials See Appendix 1		
Reading very small numbers	General Math Math Concepts Discovery Math Senior Math	Read scientific reports in news items and commercials See Appendix 2		
Reading decimal values, rational and irrational numbers	General Math Math Concepts Discovery Math Senior Math	Read news items and commercials. Giving weather reports See Appendix 2 & 3		
Symbols and language	General Math through Math Analysis	Give scientific reports which involve equations and inequalities See Appendix 4		
Addition, subtraction, multiplication and division using rational numbers	General Math Math Concepts Discovery Math Senior Math	Schedule blocks of time for commercials, news and music. Selling time spots to businesses. See Appendix 5		
Computation with time, and understanding operations using base 60	General Math Math Concepts Discovery Math Senior Math	Keep a log - Schedule time for programs. See Appendix 5		

Cluster Communications

Occupation

Guide Radio Programming and Announcing I
9638

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 189 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Ratios and Percents	General Math Math Concepts Discovery Math Senior Math	Read statistical data in news such as baseball. Compute tax in selling commercial time. See Appendix 6		
Metric measuring	General Math Math Concepts Discovery Math Senior Math	Read weather reports using Celsius scale. See Appendix 7		
Reading a number line	General Math Math Concepts Discovery Math Senior Math	Read and set meters for testing and radio station operations ie. - such as watching audio levels See Appendix 8		

Appendix I

Radio Programming and Announcing I

Example 1 Read the following numbers

(a) 8,165,243
(b) 92,147,066
(c) 12,004,609,024
(d) 415,055,070,408
(e) 9,000,143,122

Appendix II

Example 1 Read the following decimal fractions

(a) .1 (b) .002 (c) .0164
(d) .0087691 (e) .0004003

Example 2 Read the following decimal numbers

(a) 9.014
(b) .6042
(c) 143.007
(d) 4.304905

Example 3 Read the following powers of 10

(a) 9×10^5
(b) 1.2×10^{-4}
(c) 7.43×10^3

Appendix III

Example 1 Read the following

(a) 1 3/16 inches

(b) 481.8 kilometers

(c) .39 pounds

(d) $.42\frac{1}{2}$

Example 2 (a) $\sqrt{471}$

(b) $\sqrt[3]{9}$

(c) 10^{-3}

(d) 7×10^{9}

(e) $.01\frac{1}{2}\%$

Appendix IV

Example 1 Read the following mathematical symbols and statements

(a) $=$; $>$; $\neq$; $<$; $\nless$; $\geq$

(b) $75^{\circ}C$; $68^{\circ}F$ (temperatures)

(c) $3n^{2} > 42$

(d) $\sqrt{c^{2} + d^{2}} = r$

(e) $E = m \cdot c^{2}$

(f) $\pi \cdot r^{2} = A$ $\pi = 3.14159$

Appendix V — Radio Programming and Announcing I

Example 1 What is the total time needed to broadcast the following on a radio station

News headlines - 60 seconds

Commercial - 1 minute 21 seconds

News - 4 minutes 35 seconds

Commercial - 23 seconds

Music - 3 minutes 15 seconds

Commercial - 55 seconds

Example 2 If a station went on the air at 7:00:00 A.M. and off the air at 12:35:00A.M., how long did it broadcast?

Example 3 A commercial went on the air at 10:24:33 and ended at 10:25:01. How long was the commercial?

Example 4 If an announcer can speak at the rate of 220 words per minute, how much time will he need for a 260 word commercial?

Appendix VI

Radio Programming and Announcing I

Example 1 A baseball player is hitting .310. How many hits does he get in 30 times at bat?

Example 2 Cleveland has won 30 out of 50 games they have played. What per cent of their games have they won?

Example 3 Nine out of thirty-six car accidents leads to a fatality. What is the ratio of fatal car accidents?

Example 4 H and R Inc bought a commercial spot of 30 seconds with radio station KWNE for $18. At the rate of 4% what was the State tax?

Appendix VII

Example 1 Convert the following

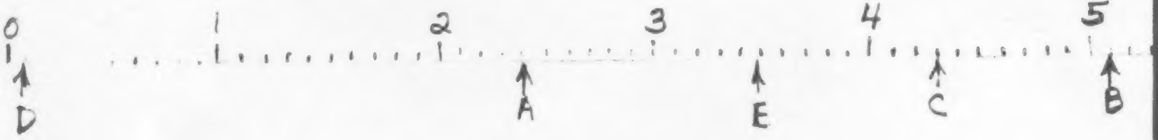
1 meter = ____Z______________ millimeter (s)
1000 meters = __________________ kilometer(s)
40 kilocycles = __________________ cycle(s)
35 milliamps = __________________ amp (s)

Example 2 Read the following temperature

(a) 90°F
(b) 26°C

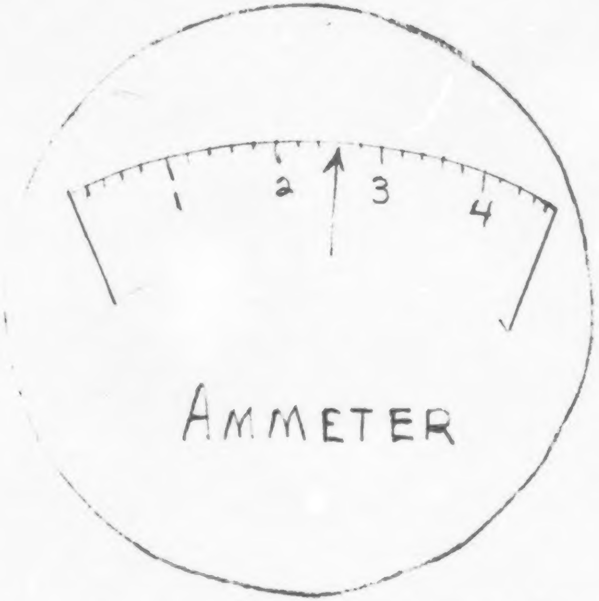
Appendix VIII   Radio Programming and Announcing I

Example 1   Read the following to the nearest tenth on the number line below



A = ____, B = ____, C = ____, D = ____, E = ________

Example 2



Give the reading on the ammeter above to the nearest tenth

Cluster Communications

Occupation

Guide Radio Programming and Announcing III 9640

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 195 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Reading large and small numbers in both words and digit form	General Math Math Concepts Discovery Math Senior Math	Read statistical and scientific reports in news and commercials See Appendix I		
Reading decimal values, all rational and irrational numbers	General Math Math Concepts Discovery Math Senior Math	Give weather reports. Reading news items and commercials See Appendix II		
Math symbols and language	General Math through Math Analysis	Give scientific reports which involve equations and inequalities See Appendix III		
Addition, subtraction, multiplication and division using rational numbers	General Math Math Concepts Discovery Math Senior Math	Schedule blocks of time for programs. Selling time spots to businesses. See Appendix IV		
Computation with time using base 60	General Math Math Concepts Discovery Math Senior Math	Keep a log - Scheduling time for programs See Appendix IV		
Ratios and per cents	General Math Math Concepts Discovery Math Senior Math Algebra I	Read statistical data in news such as baseball. Compute State tax in selling commercial time. See Appendix V		

Cluster Communications

Occupation

Guide Radio Programming and Announcing III 9640

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 196 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Metric measure	General Math Math Concepts Discovery Math Senior Math	Read weather report using Celsius scale See Appendix VI		
Reading a number line	General Math Math Concepts Discovery Math Senior Math	Read and set audio level meters See Appendix VII		

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Appendix I

Radio Programming and Announcing III

Example 1 Read the following numbers

(a) 46,042,013
(b) 1,000,004
(c) 23,189,472,111
(d) 106,096,778,345
(e) 2,017,000,266

Example 2 Read the following numbers

(a) .3
(b) .009
(c) .12456
(d) .00149
(e) .66
(f) .125

Appendix II

Example 1 Read the following numbers

(a) 8.007
(b) 496 8/19
(c) 1487 3/16
(d) 19.48
(e) 7 15/64
(f) 38 24/10000

Example 2 Read the following numbers

(a) $\sqrt{48}$
(b) 10^{-5}
(c) $\sqrt[3]{16}$
(d) 10^{7}
(e) 9.4×10^{-4}

Appendix III

Example 1 Read the following symbols and statements

(a) $<$

(b) $\ngtr$

(c) $=$

(d) $\leq$

Example 2 Read the following temperature

(a) $26^{\circ}C$

(b) $87^{\circ}F$

Example 3 Read the following statements

(a) $2n^3 \leq 16$

(b) $d = \sqrt{a^2 - b^2}$

(c) $E = m \cdot c^2$

(d) $\pi \cdot D = c \quad \pi = 3.14159$

Appendix IV Radio Programming and Announcing III

Example 1 If a radio station went on the air at 5:30:00 A.M. and off the air at 12:35:00 A.M., how long did it broadcast?

Example 2 What is the total time needed to broadcast the following

News headlines	49 seconds
commercial	38 seconds
news	5 minutes 12 seconds
commercial	42 seconds
music	3 minutes 13 seconds
commercial	53 seconds

Example 3 If an announcer can speak at the rate of 270 words per minute, how many seconds will he need for a 124 word commercial?

Example 4 Music went on the air at 11:45:39 and it stopped at 11:49:03. How long did the music tape play?

Appendix V

Radio Programming and Announcing III

Example 1 Boston won 40 out of 56 games. What per cent of their games have they won?

Example 2 A survey showed that 36 out of 64 customers asked for Daisy Dog Bun. This is 9 out of every ____________ customers or over ______________ (fraction) of the buyers ask for Daisy Dog Bun.

Example 3 A baseball player has a batting average of .280. How many hits can he expect out of 48 times at bat?

Example 4 H and R Hardware bought $260.50 worth of radio time. At 4% what State tax did they pay?

Appendix VI

Example 1 Convert the following

(a) 65 millimeters = ______________ centimeters

(b) 1 meter = ______________ millimeters

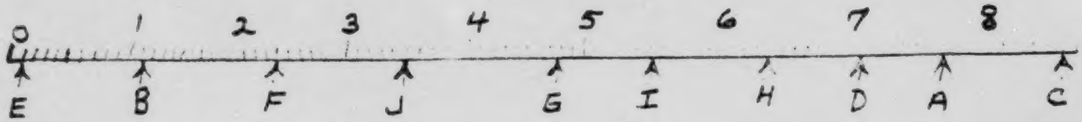
(c) 70 kilocycles = ___________ cycles

(d) 13 milliamps = ___________ amps

Example 2 Change Fahrenheit temperature to Celsius temperature using the following formula

$C = \frac{5}{9}(F-32)$ if $F = 77^{\circ}$

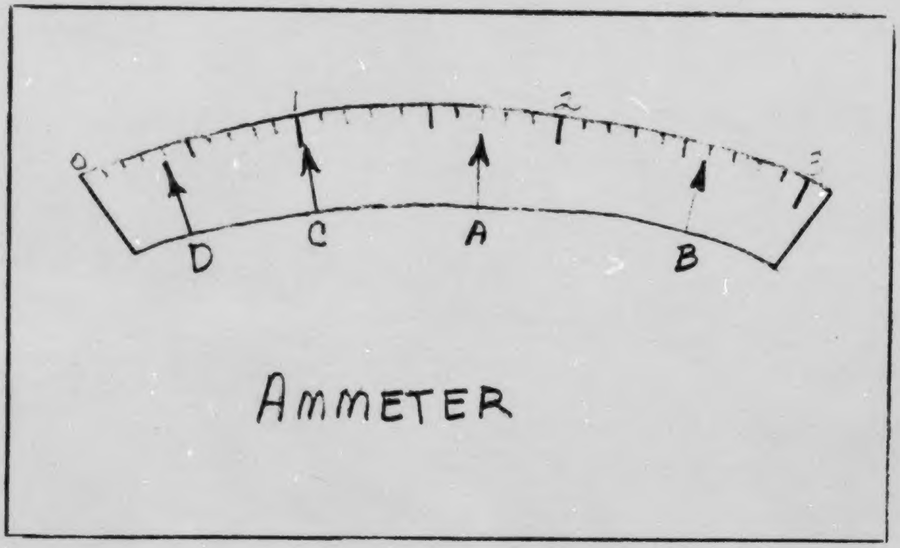
Example 1 Read the values on the number line below to the nearest tenth.



(a) A = ____ (b) B = ____ (c) C = ____ (d) D = ____ (e) E = ____

(f) F = ____ (g) G = ____ (h) H = ____ (i) I = ____ (j) J = ____

Example 2 Indicate to the nearest tenth the number of amperes shown



A = ____ B = ____ C = ____ D = ____

Cluster Communications

Occupation

Guide Radio Station Operation (Basic)
#9635

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 202 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Percentage	Basic Skills Sr. Math	Modulation monitoring - Concept used by radio broadcasters - See Appendix 1 (3rd class lic. test)		
Evaluation of formulas	Elementary Algebra	Computing Operating Power - Concept used by radio broadcasters - (3rd class lic. test) - See Appendix 2		
Multiply and divide by powers of 10	Basic Skills Sr. Math	Converting electrical terms - Concept used by radio operators - (3rd class lic. test) - See Appendix 3		
Ratio	Basic Skills Algebra Geometry	Antenna current ratio computation - Concept used by radio operators (3rd class lic. test) - See Appendix 4		
Computation with time		Keeping a log - Concept used by radio operators - (3rd class lic. test) See Appendix 5		
Reading a number line	Basic Skills	Reading meters - Concept used by radio operators (3rd class lic. test) - See Appendix 6		

Appendix 1

Example 1: Find 85% of 1000.

Example 2: What percent is 1750 of 2000?

Example 3: 50,000 is what percent of 40,000.

Example 4: What is 105% of 2200?

Example 5: If the normal reading on a meter is 6.5; and if the reading can be as much as 10% off and still be acceptable, what is the range of acceptable readings?

Example 6: The normal reading on a meter is 12.5. An acceptable reading is 5% above or below 12.5.

a) Is a reading of 11.7 acceptable or unnacceptable?

b) Is a reading of 13.0 acceptable or unnacceptable?

Appendix 2

Example 1: If $P = R \cdot C^2$, find P if R = 40 and C = 5.

Example 2: If $P = E \cdot L \cdot F$, find P if E = 1900 volts, L = 1.7 amps, and F = 80%.

Example 3: If operating power = $E_p \times L_p \times F$, find the Operating Power when E_p = 200 volts, L_p = .5 amps, and F = 70%.

Appendix 3

Example 1: 3000 volts = _____ kilovolts

Example 2: 1.5 kilovolts = _____ volts

Example 3: 4 kilowatts = _____ watts

Example 4: 875 watts = _____ kilowatts

Example 5: .7 amps = _____ milliamperes

Example 6: 250 milliamperes = _____ amperes

Appendix 4

Example 1: The antenna base current ratio for a tower is the ratio of the current meter reading for that tower to the current meter reading for a reference tower. If the antenna current for the reference tower is six amperes, find the antenna base current ratio for a tower whose antenna current is:

a) 2 amperes

b) 7 amperes

Example 2: State the ratio of 3 to 5 as a decimal.

Example 3: State the ratio of 7 to 6 as a decimal.

Appendix 5

Example 1: What is the total time needed to broadcast the following on a radio station?

music-2 minutes 50 seconds
commercial-1 minute
news-4 minutes 20 seconds
commercial-1 minute
commercial-30 seconds
music-3 minutes 10 seconds
announcement-20 seconds
music-2 minutes 20 seconds

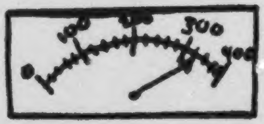
Example 2: If a record began playing at 3:12:15 p.m. and ended at 3:15 p.m., how long did it play?

Example 3: If an announcer went on the air at 11:05 a.m. and went off the air at 2:50 p.m., how long was the announcer on the air?

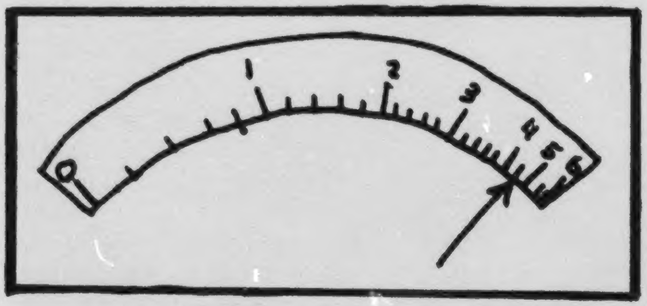
Example 4: If a newscast of 700 words must be broadcast in 4 1/2 minutes, how rapidly must the newscaster speak?

Appendix 6

Example 1: What reading is shown on this meter?



Example 2: What reading is shown on this meter?



Cluster Communication

Occupation ________

Guide Radio Station Operation and Program Production 9636

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 207 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Reading large and small numbers in both written and digit form	General Math Math Concepts Discovery Math Senior Math	Read statistical and scientific reports in news items and commercials See Appendix I		
rational and irrational numbers	General Math Math Concepts Discovery Math Senior Math	Read news items and commercials See Appendix I		
read most math symbols and language	General Math through Math Analysis	Give scientific reports which involve equations and inequalities See Appendix II		
Basic operation of addition, subtraction, multiplication and division using rational numbers	General Math Math Concepts Discovery Math Senior Math	Schedule time, keeping time log. Sell time spots to businesses. See Appendix III		
Computation with time and understanding operations using base 60	General Math Math Concepts Discovery Math Senior Math	Keep a log (3rd class license test). Schedule time for programs See Appendix III		

Cluster Communication

Occupation

Guide Radio Station Operation and Program Production
9636

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 208 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Ratios and percemtage	General Math Math Concepts Discovery Math Senior Math Algebra I Geometry I	Read statistical data in news such as baseball. Compute state tax on sales. Modulation monitoring (3rd class license test). Antenna current rates computation (3rd class license test). See Appendix IV		
Multiply and divide by powers of 10	Math Concepts Discovery Math Senior Math	Convert electrical terms used in radio operating (3rd class license test) See Appendix V		
Evaluation of formulas	General Math Math Concepts Discovery Math Senior Math Algebra I	Radio operators - compute station power (3rd class license test) See Appendix VI		
Metric measure	General Math Math Concepts Discovery Math Senior Math	Read weather reports using Celsius scale See Appendix VII		
Reading a number line	General Math Math Concepts Discovery Math Senior Math	Read meters. See Appendix VIII		

Cluster Communications

Occupation

Guide Radio Station Operation &
Program Production #9636

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 209 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Computations with time reading a number line	Basic Skills	Keeping a log - Concept used by radio operators Reading meters - used by radio operators - See Appendix VIII Note: Students in this course must have an FCC 3rd class license, which does require some math concepts. These are summarized with course #9635 - Radio Station Operation		

Example 1 Read the following numbers

(a) 17,496,111

(b) 1,002,443

(c) 12,047,146,973

(d) 492,000,186,077

(e) 16,005

Example 2 Read the following decimal fractions

(a) .9 (b) .045 (c) .00126

(d) 143.004 (e) 4.000653

Example 3 Read the following powers of 10

(a) 5×10^3 (b) 8.7×10^{-6}

Example 4 Read the following numbers

(a) 87 5/6 (b) 349 13/10000

(c) $\sqrt{189}$ (d) $\sqrt[5]{42}$ (e) [-4]

Example 1 Read the following mathematic symbols and statements

(a) $=$ (b) $<$ (c) $\geq$ (d) $\neq$ (e) $\not\angle$

Example 2 Read the following statements

(a) $\angle ABC = 43^\circ 16'$ (b) $\triangle ABC \cong \triangle CDB$

Example 3 Read the following

(a) 85° F (b) 24° C

(c) $E = m \cdot c^2$ (d) $\pi \cdot D = C$

$\pi = 3.14159$

(e) $\sqrt{x^2 + y^2} = r$ (f) $.4n^2 < 10$

Example 1 What is the total time needed to broadcast the following on a radio station

News headlines	60 seconds
Commercial	1 minute 2 seconds
News	5 minutes 13 seconds
Commercial	36 seconds
Music	3 minutes 19 seconds
Commercial	49 seconds

Example 2 If a station went on the air at 5:00:00 A.M. and off the air at 1:30:00 A.M., how long did it broadcast?

Example 3 A commercial went on the air at 1:10:26 and ended at 1:11:05. How long did it last?

Example 4 If an announcer can speak at the rate of 225 words per minute, how much time will he need for a 160 word commercial?

Appendix IV

Example 1 If the normal reading on a meter is 5.4 and the reading can be as much as 10% off and still be acceptable, what is the range of acceptable readings?

Example 2 If operating power = E_p x L_p x F, find the operating power when $E_p = 350$ volts, $L_p = .5$ amps, F = 70%

Example 3 State the ratio 2 to 4 as a decimal.

Example 4 A baseball player is hitting .375. How many hits does he get in 40 times at bat?

Example 5 Hand Lotion Inc. bought a commercial spot of 30 sec. with radio station KMEB for $15. At the rate of 4%, what was the State tax?

Appendix V

Example 1

3000 volts = ______________________ kilowatts

1.75 kilowatts = ____________________ volts

.4 amps = _________________________ milliamps

375 milliamps = ____________________ amperes

Example 2

(a) $\frac{10^4}{10^2}$ = ____________________ (b) $10^3 \times 10^5$ = ____________

(c) $10^{-2} \times 10^4$ = ____________ (d) $\frac{10^3}{10^7}$ = ____________________

Appendix VI

Radio Station Operation and Program Production

Example 1 In the formula

$I = \frac{E}{R}$ find R if $E = 65$; $I = 5$

Example 2 If $P = R \cdot I^2$, find P if $R = 30$ ohms, $I = 3$ amps

Example 3 If $P = E \cdot L \cdot F$ find P if $E = 2400$ volts; $L = 1.3$ amps and $F = 75\%$

Appendix VII

Example 1 Read the following temperatures

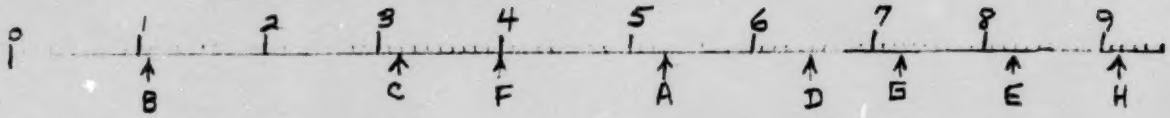
(a) $40^\circ F$

(b) $22^\circ C$

Example 2 Change the following Fahrenheit temperatures to Celsius

$C = \frac{5}{9}(F - 32)$; $F = 212^\circ$

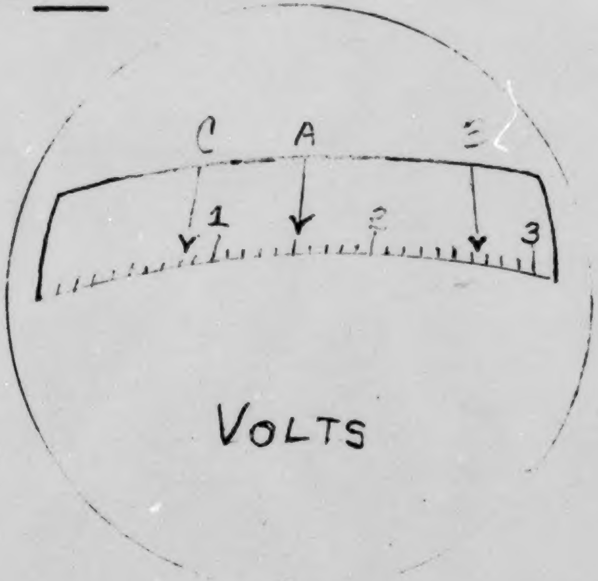
Example 1 Give the following readings to the nearest tenth



A= ____ B = ____ C = ____ D = ____ E = ____ F = ____

G = ____ H = ____

Example 2



Give the reading to the nearest tenth indicated on the voltmeter

A = ____ B = ____ C = ____

Cluster Communications

Occupation

Guide Screen Printing I #9662

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 216 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Reading an English ruler (nearest 1/16 inch)	Basic Skills Senior Math	Cut a piece of stencil paper the same size as the screen frame. See Appendix 10		
Reading an English ruler (nearest 1/16 inch)	Basic Skills Senior Math	Center stencil over original copy (must measure from edge of frame). See Appendix 10		
Reading an English ruler (nearest 1/16 inch)	Basic Skills Senior Math	Center and mount original on base board (must measure from the edge). See Appendix 10		
Measure 1/4th, 1/3rd 1/2 of a cup also quarts	Basic Skills	Mix sizing solution for screen fabric (must measure sizing and water). See Appendix 6		

Appendix 6

1 gallon is equivalent to 4 quarts

__________ gallons = 8 quarts

__________ gallons = 32 quarts

5 gallons = __________ quarts

1½ gallons = __________ quarts

1 quart is equivalent to 2 pints

2 quarts = __________ pints

10 pints = __________ quarts

5 pints = __________ quarts

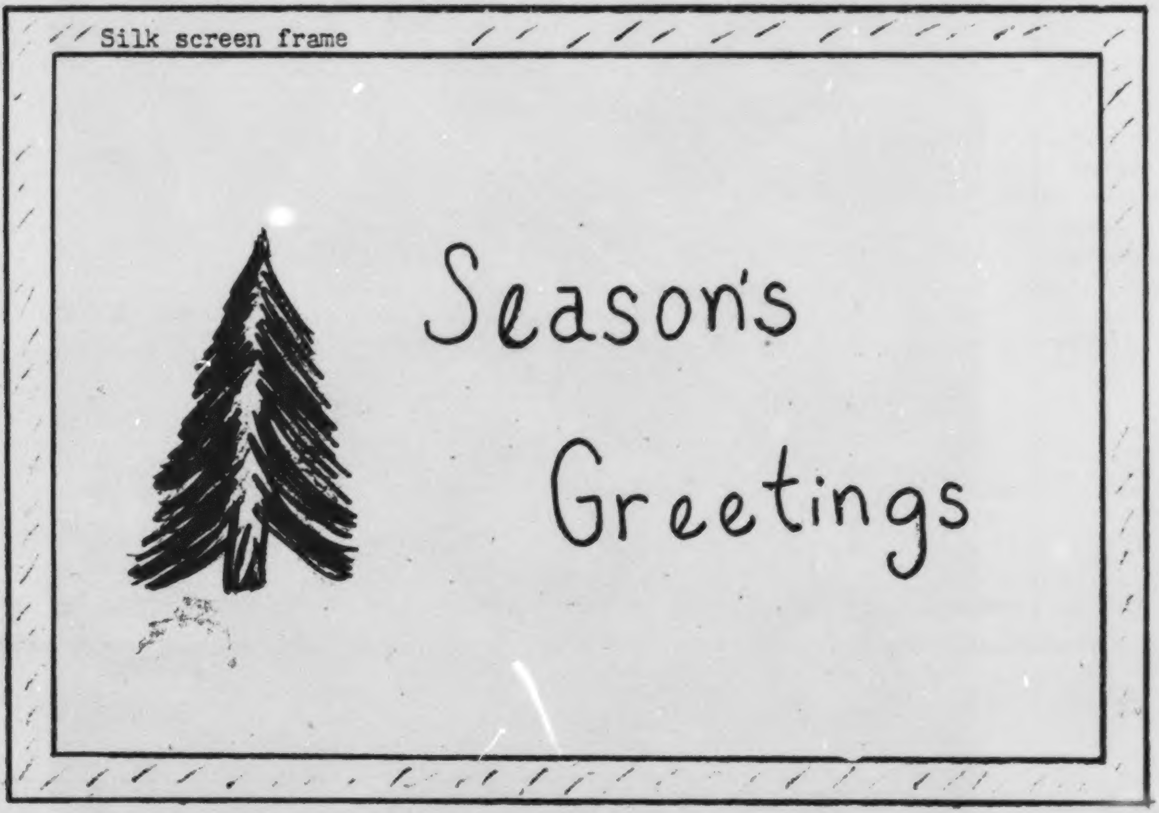
__________ quarts = 24 pints

1 gallon = __________ quarts = __________ pints

__________ gallons = 12 quarts = __________pints

Appendix 10 (Continued)

Essie is silk screening her Christmas cards this year. She wants the top of the tree to be $1\frac{1}{4}$" from the top of the card and the card centered. Draw in the outline of the correct placement of the Christmas card. The Christmas card is 4 inches high and 6 inches wide.



Cluster Communications

Occupation

Guide Screen Printing II #9663

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 219 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Reading Tables	Basic Skills Senior Math	Use a percentage calculator to find enlargement or reduction of photograph		
Ratios and Proportion	Basic Skills Senior Math	Mix developing chemicals for film according to ratios. See Appendix IV		
Conversions In Liquid Measurement (ounces - cups - pints - quarts - gallons)	Basic Skills Senior Math	Mix developing chemicals stored in multi-gallon containers. See Appendix III		To mix chemicals in proper proportion you may add x pints to y gallons water to achieve a 1 to 10 ratio
Measure to nearest 1/16 inch with a ruler	Basic Skills Senior Math	Measure from edge of frame to align film under screen. See Appendix V		
Count by 3's, 5's and 10's	Basic Skills	Determine correct amount of exposure time for a film. See Appendix II		A test exposure is made with exposure times usually a multiple of a few seconds.

Cluster Communications

Occupation ________________

Guide Screen Printing II #9663

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 220 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measure with a ruler (to the nearest 1/16)	Basic Skills Senior Math	Measure screen and cut emulsion film the same size. See Appendix V		
Use a scale (to weigh ounces)	Basic Skills Senior Math	Measure fluid emulsion and sensitizer to make the sensitized fluid emulsion for photo screen printing. They may be liquid or dry chemicals. See Appendix III		
Liquid measurements: teaspoon, tablespoon, fractional cups	Basic Skills Senior Math	Measure fluid emulsion and sensitizer to make the sensitized fluid emulsion for photo screen printing. They may be liquid or dry chemicals. See Appendix III		
Read Charts and Tables	Basic Skills Senior Math	Read Kodak's exposure computer and density guide to find film exposure time and flash exposure. See Appendix I		

Appendix I

Hand-Held Meter

The ASA is set to the number recommended by the film manufacturer. The meter is pointed at the subject and the center dial turned until the needles overlapped. Now you can read the dial to choose the time and F-stop you want. The correct shutter speed (time) is above the corresponding F-stop (F1).

Example

F-stop of 1.4 correct speed is 1/1000
F-stop of 11 correct speed is 1/15.

Use the above picture to find the shutter speed (time) for the following F-stops (F1)

F-stop	Shutter speed
4	____________
16	____________
2	____________
5.6	____________

Appendix II

1. Fill in the blanks to complete each pattern.

____, 15, 20, 25, ____, ____, ____.

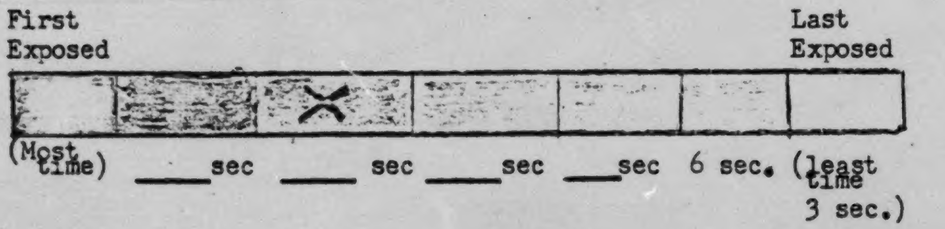
12, 15, ____, 21, ____, ____, ____.

90, 80, ____, ____, 50, ____, ____, ____, ____.

72, 70, ____, ____, 64, ____, ____.

2. To find out how long film needs to be developed to get a good picture a TEST STRIP is made. A TEST STRIP is made by exposing successive sections of the test paper for a fixed amount of time. A TEST STRIP was made tieh each successive section being exposed for an additional 3 seconds.

TEST STRIP



Fill in the blanks to show how long each section was exposed. The best exposure time turned out to be the section with the "X" on it. How long was that section exposed? ________

Appendix III

1 gallon is equivalent to 4 quarts

_________ gallons = 8 quarts

_________ gallons = 32 quarts

5 gallons = _________ quarts

1½ gallons = ________ quarts

1 quart is equivalent to 2 pints

2 quarts = _________ pints

10 pints = _________ quarts

5 pints = __________ quarts

_________ quarts = 24 pints

1 gallon = ____________ quarts = ___________ pints

_________ gallons = 12 quarts = __________pints

Appendix IV

In making a contact print you must mix a developer. To dilute the developer properly you mix 2 parts water with 1 part developer. Fill in the blanks so the proper dilution will be obtained.

2 cups water to _________ cup developer

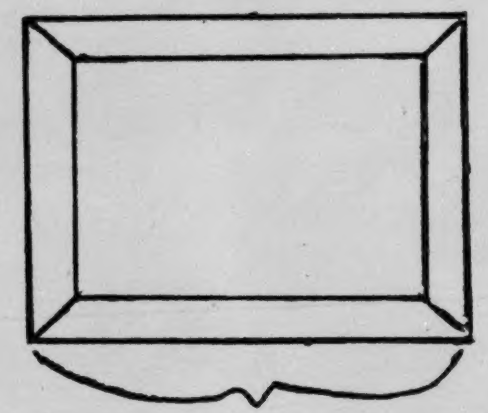
1 cup water to __________ cup developer

_________ cups water to 3 cups developer

_________ cups water to 4½ cups developer

Appendix V

Measure the width of this picture frame. Find the midpoint and put an "X". Measure to the nearest 1/8 inch.

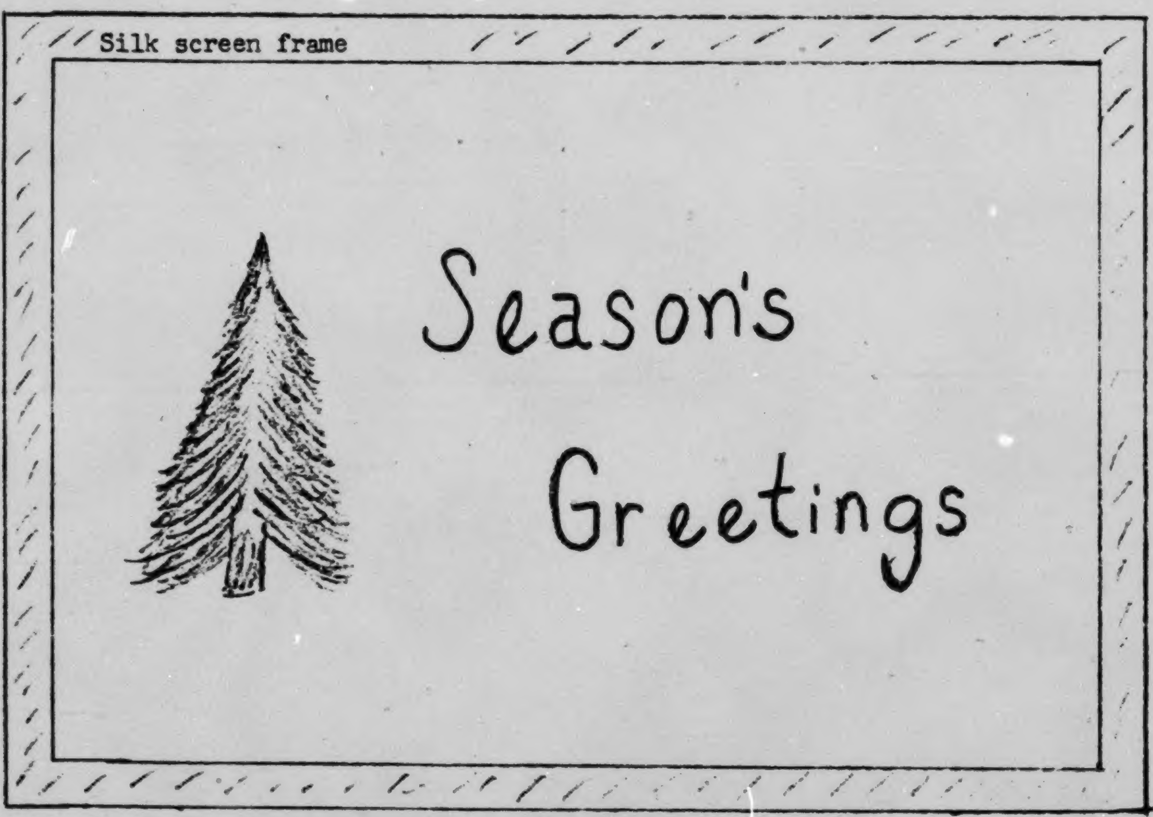


continued

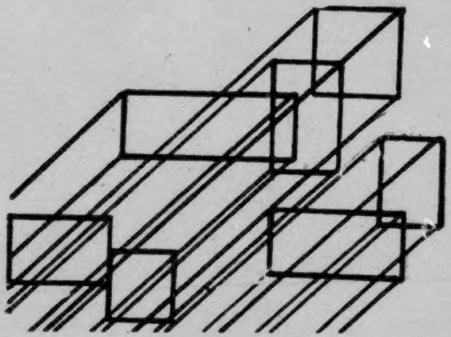
____

Appendix V (Continued)

Essie is silk screening her Christmas cards this year. She wants the top of the tree to be 1$\frac{1}{4}$" from the top of the card and the card centered. Draw in the outline of the correct placement of the Christmas card. The Christmas card is 4 inches high and 6 inches wide.



CONSTRUCTION



319

WHAT IS THE CONSTRUCTION CLUSTER?

It is the study of the processes and socioeconomic problems of construction. Planned learning experiences include experimenting, designing, constructing and evaluating building management methods and production processes using tools and materials for scale models and actual situations. Student activities include constructing prototypes, site selection, surveying, soil testing, contracting, rehabilition, site preparation and the construction of modules with all support systems. The economics, occupations and consumer information related to the construction industry are stressed. Students will be able to identify and evaluate their interests, abilities, value judgments and needs as they relate to construction in our society. Opportunities are provided for students who desire to gain a marketable skill in occupations of their choice.

Instructional areas include woodworking, cabinetmaking, furniture construction, upholstering, building trades, land surveying, painting and paperhanging and machine operation.

SUGGESTED COURSE OFFERINGS
LEADING TO OCCUPATIONS
IN THE
CONSTRUCTION FIELD

CABINET MAKER

Suggested Courses:
- Wood Technology I
- Wood Technology II
- Wood Technology III
- Cabinet Making I
- Cabinet Making II
- Cabinet Making III

WOODWORKING MACHINE OPERATOR

Suggested Courses:
- Wood Technology I
- Wood Technology II
- Wood Technology III
- Furniture Manufacturing I
- Furniture Manufacturing II
- Furniture Manufacturing III

UPHOLSTERER TRAINEE

Suggested Courses:
- Upholstering Techniques I
- Upholstering Techniques II
- Upholstering Techniques III

BUILDING TRADES TRAINEE

Suggested Courses:
- Wood Technology I
- Introduction to Building Trades
- Frame Construction
- Finish Carpentry
- Cement and Block
- Electrical Wiring
- Plumbing and Heating

BUILDING TRADES TRAINEE (HUD)

Suggested Courses:
- Wood Technology I
- Wood Technology II
- Introduction to Building Trades
- House Rehabilitation I
- House Rehabilitation II
- House Rehabilitation III

LAND SURVEYOR

Suggested Courses:
- Surveying I
- Surveying II
- Surveying III

PAINTING AND PAPERHANGING TRAINEE

Suggested Courses:
- Wood Technology I
- Painting and Paperhanging I
- Painting and Paperhanging II

Cluster Construction

Occupation

Guide Cabinet Making I #9677

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 229 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Reading and understanding numbers that are less than 1.	Basic Math	Adjusting cutting tools, e.g., router, shaper, saws, jigs, jointers, etc., used by cabinetmaker.	Millwork Pattern Maker (or any occupation using tools with adjustments)	See Appendix 1
Working with fractions and whole numbers	Geometry Sr. Basic Math	Understanding door design - lipped, flush, raised panel, sliding, dowel jointed, mitered, etc., and numbers involved.	Design Architecture Sash and Door Carpenter	See Appendices 2, 3, 5 & 13
Understanding numbers, angles, etc.	Basic Skills in Mathematics and Geometry	Application of miters and mortise & tenon in construction of cabinet doors	Furniture Making Carpentry	See Appendices 2, 3 & 4
Adding and Subtracting numbers. Reading comprehension of number problems.	Basic Math Skills	Hanging doors as performed by a sash and door person. Following instructions.	Carpentry	See Appendix 14

Cluster Construction

Occupation ____________

Guide Cabinet Making I #9677

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 230 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Reading and Understanding numbers and dimension	Basic Mathematics Math applied to Drafting, Geometry	Major elements of a cabinet and reading a built-in plan. Understanding the specifications of cabinets in cabinet making.	Carpentry, Design, Architecture, Job Estimating	See Appendix 6
Multiplication, Division, Adding and Subtracting Whole Numbers, Fractions and Decimals	Math - Basic Skills	Making a bill of materials for cabinets	Cost Accounting Working in a lumber yard office Contracting	See Appendices 7 and 12

Note - Please refer to Wood Technology Guides 9675 and 9776 for Math Concepts that are duplicated in Cabinet Making 1 #9677.

Cluster Construction

Occupation

Guide Frame Construction #9684

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 231 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Addition, Division, Percents	Basic Skills Sr. Math	Grading systems, tests, evaluations	Teaching Supervision	See Appendices 11 & 18
Addition, Subtraction, Multiplication, Division with Whole Numbers, Decimals and Fractions	Basic Mathematics	Calculate board footage and cost Calculate square footage and cost Calculate lineal length and cost	Cost Accounting Job Estimating Lumber Yard Sheet Metal Decoration	See Appendices 7, 10 & 12
Understanding of angles, degrees & fractional numbers	Basic Mathematics Geometry	Identifying and using the various saws and how to sharpen them	Saw Sharpening Shop Teaching Home Shop Millwright	See Appendices 2, 8, 9, 19
Knowledge of angles; reading numbers by 16ths, etc.	Geometry Basic Mathematics	Layouts using miter joint, cutting a chamfer; reading combination square	Carpentry Wood Shop Teacher/Worker Cabinetmaker	See Appendices 1, 2, 8 & 16
Understanding vertical, horizontal, right angles, parallel lines	Geometry Basic Skills	Reading a level, plumbing a wall, squaring an edge, etc.	Masonry Construction Remodeling	See Appendices 15, 16 & 20

Cluster Construction

Occupation

Guide Frame Construction #9684

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 232 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Scale Drawings Basic Functions with Whole Numbers and Fractions Measurement	Geometry Business Mathematics Basic Skills in Math	Lay out and plan a floor plan including costs, etc. Bridging Cuts	Remodeling Lumber Yard Architect	See Appendices 1, 3, 6, 7, 8, 10, 12, 15, 22
Scaled Drawings Reading Plans with Numbers Understanding angles, parallel lines, square corners, etc.	Geometry Elem. Algebra Sr. Basic Math	Framing walls with windows and doors, roof ~~rafters,~~ board cutting, etc. Consider load-bearing features, overhangs, plumb cuts, etc.	Draftsperson Architect Engineering Remodeling	See Appendices 1, 2, 3, 6, 7, 8, 10, 12, & 15

NOTE: There is no better illustration of the need for mathematics in construction than in building a house. The application of mathematics is needed throughout the entire project. A carpenter who does not know mathematics as it is applied to carpentry is at a distinct disadvantage. A person could write many volumes on the mathematics in a carpenter's square alone. Lack of time and space have limited the elaboration or coverage here.

Cluster Construction

Occupation

Guide Introduction to the Building Trades #9683

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 233 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Mathematics applied to drawings Ratio & Proportion Knowledge of Measure	Geometry Engimeering-Drafting	Use of drawings, bluepints, plans, scaling elevations, etc.	Architecture Contracting Drafting Remodeling	See Appendices 6 & 15
Add-Subt-Mult-Divide with Whole Numbers, Decimals and Fractions	Basic Math	Calculate board footage and cost Calculate square footage and cost Calculate lineal length and cost	Cost Accounting Job Estimating Lumber Yard Sheet Metal Work Decorator	See Appendices 7 & 10, 12
Reading Numbers from instruments and interpreting results	Basic High School Math and Geometry	Carpentry using square, miter, ruler, T-Bevel Marking Gauge, level, skill in layouts	Machine Tooling Remodeling Masonry Cabinetmaking Plumbing	See Appendices 1, 2 & 16
Graphing and chart analysis as they relate to math	Basic Math Statistics Geometry	Interpreting charts as useful information in the building trades	Occupations where using charts is applicable	See Appendices 9 & 17
Polygons, Angles, Geometric Constructions	Geometry Elementary Algebra Basic Mathematics	Cut a variety of polyangles; lay out angles; transfer angles with a T-BeVEL: lay out plans	Draftsperson Painter Remodeler	See Appendices 2, 8, 9, 16, & 21

Cluster Construction

Occupation

Guide Painting and Decorating #9688

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 234 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measuring Liquids Ratio & Proportion	Sr. Math Basic Skills Algebra	Mix paints and stains to match a given color	Paint Store Home Improvements Art	See Appendix 24
Knowledge of 4 math functions and their applications	Basic Math Algebra Geometry	Calculating painting costs	Job Estimating Ordering materials Paint Store	See Appendices 1, 7,10,12, & 25
Multiplication and Division with whole numbers and fractions Addition and Subtraction Concept of Space Relations	Sr. Math Geometry	Figuring amount of wallpaper needed for a given job	Job Estimating Decorating Shop	See Appendix 26

Cluster Construction

Occupation

Guide Surveying I #9694

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 235 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Reading a number line divided into hundredths	Basic Skills	Read a steel tape - Concept used by surveyors - See Appendix 1		
Find the means of two measurements	Basic Skills	Measure a distance twice and find the means - Concept used by surveyors - See Appendix 18		
Addition of decimal mixed numbers	Basic Skills Sr. Math	Find the total distance measured - Concept used by surveyors - See Appendix 3		
Perpendicular lines	Basic Skills Geometry	Erect a perpendicular line - Concept used by surveyors - See Appendix 34	Construction Workers	
Right triangle	Geometry	Constructing a right triangle - Concept used by surveyors - See Appendix 35	Construction Workers	
Pythagorean Theorean	Geometry	Constructing a right triangle - Concept used by surveyors - See Appendix 9	Construction Workers	
Similar triangles	Geometry	Constructing a right triangle - Concept used by surveyors - See Appendix 21	Construction Workers	
90^0 Angle	Geometry	Prolonging a line past on obstacle - Concept used by surveyors - See Appendix 34		
360^0 Complete rotation: minutes, seconds	Geometry	Reading a transit - Concept used by surveyors - See Appendix 8		
Add degree, minute, and second measurements	Geometry	Reading a transit - Concept used by surveyors - See Appendix 9		

Cluster Construction

Occupation

Guide Surveying I #9694

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 236 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measuring angles	Basic Skills Geometry	Interior angle traverse - Concept used by surveyors - See Appendix 2		
Sum of the measures of the interior angles of a polygon	Geometry	Interior angle traverse closure - Concept used by surveyors - See Appendix 36		
Addition and subtraction of degree, minute, and second measurements	Geometry	Interior angle traverse closure - Concept used by surveyors - See Appendix 9, and 40		
Division of angle measures by whole numbers	Geometry	Interior angle traverse closure - Concept used by surveyors - See Appendix 37		
Parallel lines are everywhere equidistant	Geometry	Intersection of lines - Concept used by surveyors		This is a fact which is proved in Geometry
If two lines are parallel, corresponding angles are equal	Geometry	Intersection of lines - Concept used by surveyors - See Appendix 38		
Reading a number line divided into hundredths	Basic Skills	Read a Philadelphia Rod. - Concept used by Surveyors - See Appendix 1		
Adding and subtracting mixed decimals	Basic Skills Sr. Math	Determining elevation - Concept used by Surveyors - See Appendixes 3 and 39		

Cluster Construction

Occupation

Guide Surveying I #9694

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 237 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Accuracy of angle measures	Basic Skills Geometry	Radiation - Concept used by surveyors - See Appendix 2		
Accuracy of measures of length	Basic Skills	Radiation - Concept used by surveyors - See Appendix 1		

Cluster Construction

Occupation

Guide Surveying II #9695

Sht 238 of

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement of Angles Using instruments for measurement	Geometry Algebra-Trig Surveying	Using the Azimuth and bearing in measuring degrees for surveying land boundaries using the transit	Engineering Construction Geology Highway Constr.	See Appendices 1, 2 & 30
Use of fundamental skills Knowledge of formulas	Basis Math Algebra Geometry Surveying	Measuring land areas by square footage and acres Consideration of topography Contour mapping	Real Estate Law Investments Taxation Architecture Engineering	See Appendices 25 & 31
Knowledge of equations Trigonometry Reading Tables Fundamental calculations	Algebra Geometry Surveying	Stadia surveying using Philadelphia Rod and Transit Use of Grid Paper	Drafting Land Purchasing Navigation	See Appendices 9 & 32
Converting dimensions Basic skills in mathematical computation Spatial Relations	Basic Math Algebra Geometry Surveying	Scale drawings as used by the surveyor and associates	Drafting Architecture Mapping Photogrammetry	See Appendices 6, 15, 21 & 33

NOTE: A surveyor must know his/her mathematics and its applications.

Cluster CONSTRUCTION

Occupation

Guide Surveying III #9696

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

Sht 239 of

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
NOTE:	To avoid repetition, please refer to interrelated curriculum for Surveying I and II. Surveying III includes the interrelated concepts that are taught in Geometry and Algebra-Trigonometry but have been covered except for the following:			
Converting degrees to minutes and seconds	Geometry Algebra-Trig	Measuring angles accurately to degrees, minutes and seconds	Navigation Machine Shop Astronomy	See Appendix 41

Cluster Construction

Occupation

Guide Upholstery Technology I #9745
II #9746

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 240 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement	Sr. Basic Math Geometry	Measure and cut commercial edge rolls	Fabric Shop	See Appendices 1 & 27
Spatial Relations Concept Measurement Basic Fundamentals	Sr. Math Geometry	Fabric layout Furniture measurement for proper yardage costs	Furniture Store Interior Design	See Appendices 6, 8, 27 & 28
Measuring Ability to read numbers less than one Basic Math Fundamentals	Sr. Math Geometry Basic Skills	Planning Measuring, ordering jack-chain Boarder Rod and S&C wire Cut and sew fabric. Make a fabric pattern Scale Drawings	Hardware Store Catalog Ordering Remodeling Job Estimating Factory Work Canvas Shop	See Appendices 1, 3, 6, 8, 12, 27, 28 & 29

NOTE: An upholstery worker who is proficient in mathematics should complete a quality job more quickly and have less waste.

Cluster Construction

Occupation ____________

Guide Wood Technology I #9675

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 241 of ____

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Working with fractions	Basic Skills Sr. Math	Plane stock to desired thickness (Used by carpenters and cabinet makers)	Occupations working with wood	See Appendix 1
Reading angles accurately	Basic Skills Sr. Math Geometry	Cut a chamfer and bevel (Used by carpenters and cabinet makers)	Setting saw angles Sharpening drill bits	See Appendix 2
Using angles for application	Basic Skills Sr. Math Geometry	Cut a miter (Used by carpenters and cabinet makers; machinists)	Using a sliding T-Bevel Using the Miter Box Setting a Table Saw	See Appendix 3
Knowledge of Circles; adding and subtracting fractions	Basic Skills Sr. Math Geometry	Bore to a specific size and depth (Used by machinists, carpenters, cabinet makers, mechanics)	Drilling holes in wood, metal, etc.	See Appendix 4
Measurement working with fractions	Basic Skills Sr. Math	Construct wood joints: Rabbet, Dado, Groove and Edge (Used by cabinet makers)	Building cabinets, drawers, etc.	See Appendix 5

Cluster Construction

Occupation

Guide Wood Technology I #9675

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 242 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Using numbers in a proportion; adding and subtracting fractions	Basic Skills Drafting Geometry	Dimensional Drawing (Used by draftsmen, blue printers, carpenters, machinists, etc.)	Drafting	See Appendix 6
Working with decimals and fractions; (multiplication; subtraction; addition; subtraction)	Basic Skills Sr. Math	Make out a bill of materials (used by contractors)	Office work at a lumber yard	See Appendix 7
Working with fractions and decimals	Basic Skills Sr. Math Drafting Geometry	Measure and layout stock, e.g., various joints (used by craftsmen)	Occupations that work with wood	See Appendices 1, 2,3,4 and 8

Cluster Construction

Occupation

Guide Wood Technology II #9675

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

Sht 243 of

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
An appreciation for dimension	Basic Skills Geometry	Reading drawings (working, detail assembly, sectional), pre-job layouts following blueprints and plans.	Architecture Machine Shop	See Appendix 6
Interpreting correct information from tables	Basic Math - Geom. - Algebra - Trig.	Reading notes, schedules, tables. Contractor or designer would use knowledge as well as the foreman of a job.	Communication, Banking, Engineering, Contracting Jobs	See Appendix 9
Multiplication, Adding and Subtracting Whole Numbers and Fractions	Basic Mathematics Geometry	Computing measures, board, lineal and square (used by job estimators).	Lumber Industry, Carpeting, Tile Laying, etc.	See Appendice 1, 2, 7 & 10
Working with angles, fractions and whole numbers	Basic Skills	Laying out and cutting joints to dimension (used by workers in a wood shop, e.g., mortise and tenon, miter, lap and dowel)	Furniture construction; occasionally in a machine shop	See Appendix
Working with fractions and per cents	Basic Skills Algebra	Computing waste (fractional, allowance, percentage) used by contractors and job planners.	Any type of occupation that figures amount of waste in material use	See Appendix 11

APPENDIX 1

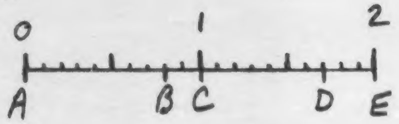
Example 1

How long is AB?

How long is BC?

How long is CD?

How long is DE?



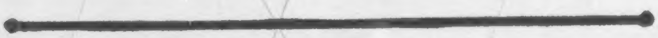
AE = 2"

Example 2

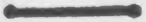
What is the length of CD minus DE?

If a board had the thickness of AB and you planed off 1/16", what would be the new thickness?

Example 3: Measure this segment to the nearest inch:



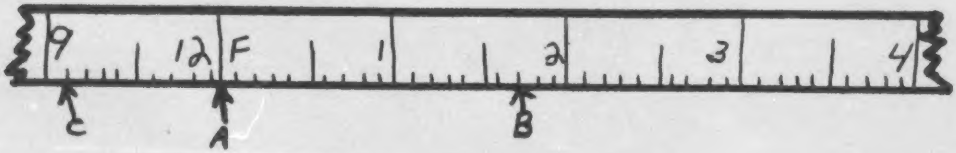
Example 4: Measure this segment to the nearest millimeter:



Example 5: Round off 12.37 ft. to the nearest foot.

Example 6: Round off 83.68 ft. to the nearest foot.

Appendix 1
Continued



Example 7: Name the number indicated by A.

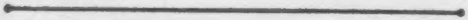
Example 8: Name the number indicated by B.

Example 9: Name the number indicated by C.

Example 10: Label the point at 12.25 ft with the letter D.

Example 11: Label the point at 11.96 ft. with the letter E.

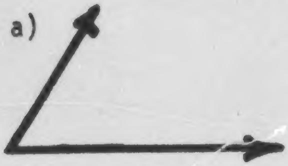
Example 12: Use the scale pictured above to measure this line segment:



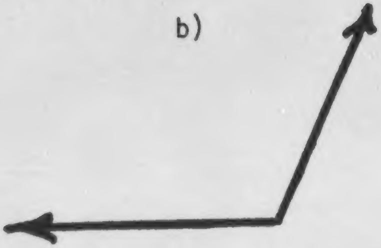
Appendix 2

Example 1: Measure these angles to the nearest degree:

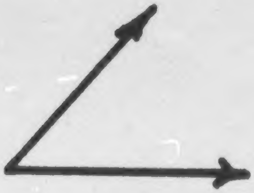
a)

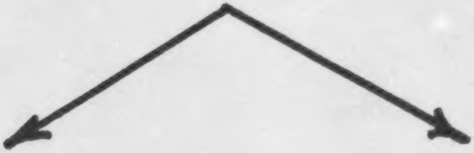


b)



Example 2: Measure these angles to the nearest 5 degrees:

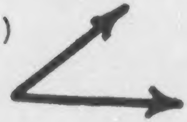




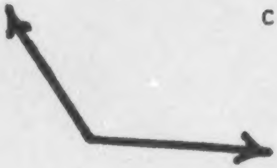
Appendix 2

Example 1: Measure the following angles. Use a protractor.

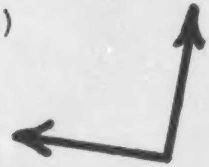
a)



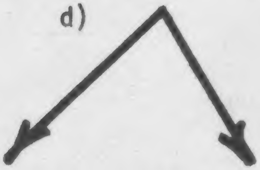
b)



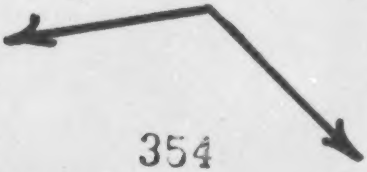
c)



d)



e)



APPENDIX 2

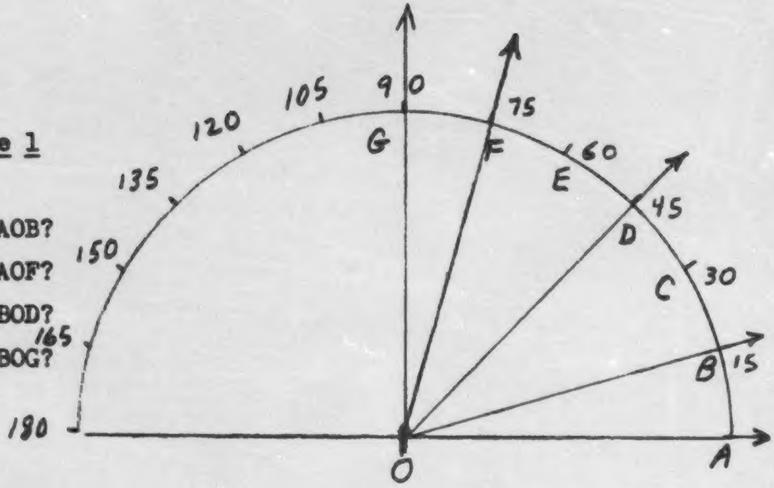
Example 1

What is the measure of ∠AOB?

What is the measure of ∠AOF?

What is the measure of ∠BOD?

What is the measure of ∠BOG?

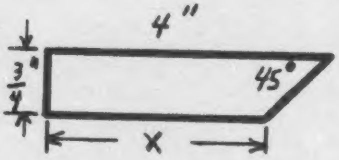


Example 2

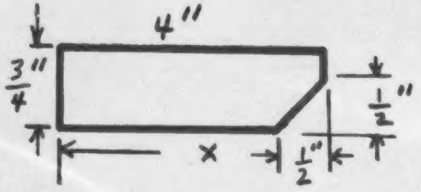
What is the measure of ∠AOG minus ∠AOB?

What is the measure of ∠AOF minus ∠BOD?

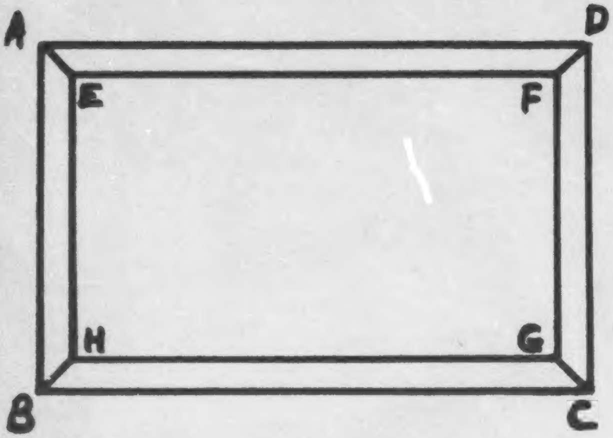
If you were given a board 3/4" by 4" by 3' and beveled one length at 45° then what would be its width (X)?



If you put a ½" by ½" chamfer on a similar 4" board, what would be its width X.?



APPENDIX 3



Example 1

If AB = 24" and DC = 36" and the border around EFGH is 1" -

Then what are the dimensions of EFGH?

What size angle would be mitered at each corner?

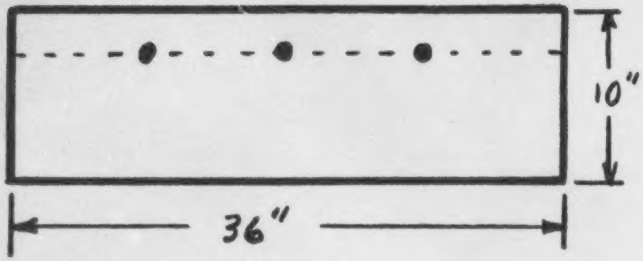
What is the length of AE?

Example 2: Add: 100, 100, 100, 100, 47.86

Example 3: Find the sum: 100 + 100 + 100 + 100 + 100 + 100 + 87.78

APPENDIX 4

Example 1



On a line 2" from the top of the diagramed board, evenly space 3, quarter-inch circles. Write the center of each circle's measurements below.

__________ __________ __________

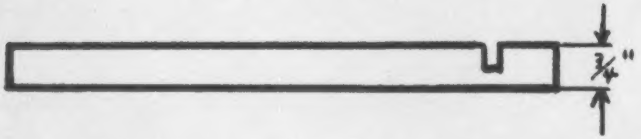
What is the distance between each circle?

____

Example 2

Repeat Example 1, but this time evenly space 4 quarter-inch circles.

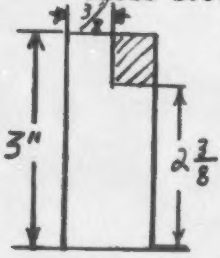
Example 3



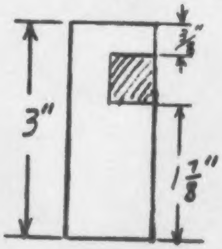
You plan to drill a ¼" hole in the 3/4" plywood at the left. If the depth is to be 5/16", what part of the board (width) is not drilled? Hint: 3/4" - 5/16" = ______________.

APPENDIX 5

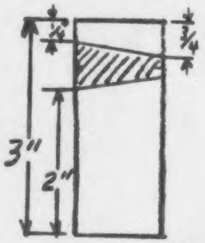
Cross section of 2" by 3" by 3/4" board



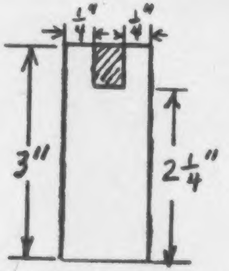
Rabbet



Dado-Grooving



Lap Dovetail



Mortise and Tenon

In each case above, find the dimensions of the shaded portion.

APPENDIX 6

The drawing below is partial of a built-in kitchen. Study it and answer the questions.

1. What is the height of the sink?

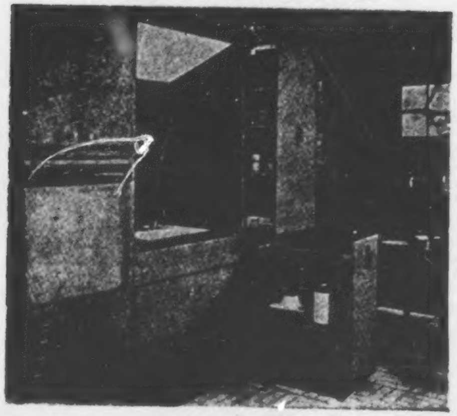
2. What are the dimensions of the space allowed for the dishwasher?

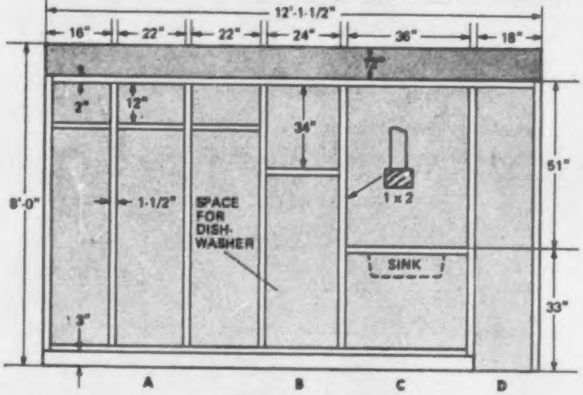
3. How wide is the sink region?

4. The roll-out cart fits in the space at the right of the sink. What is the size of this opening?

5. How large is the area for the slide-out shelves above the roll-out cart?

BUILT-IN KITCHEN PLANS





FRONT ELEVATION

APPENDIX 7

1. What is the cost of 48 ft. of molding at 7¢ per linear foot?

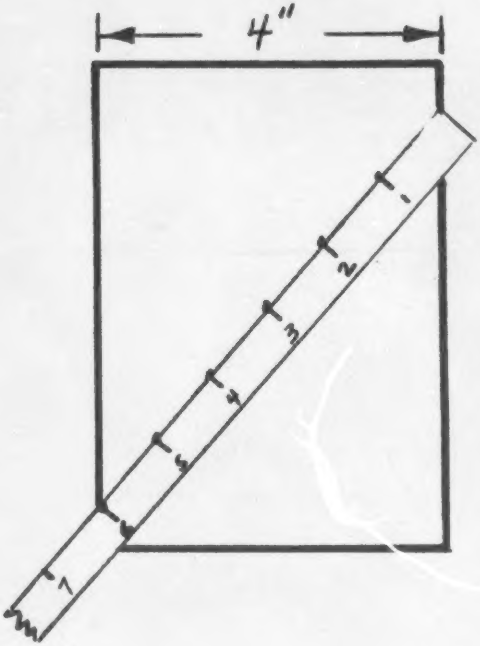
2. What is the cost of 10 - 4 X 8 feet sheets of plywood at 34¢ per sq. ft.?

3. What is the cost of 25 boards 12" by 12' by 3/4" if the quality of board is $350.00 per 1000 bd. ft?

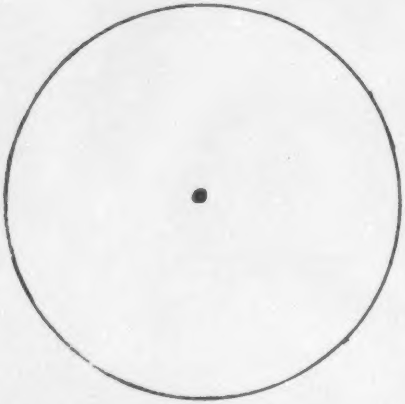
4. At a wage of $8.75 per hour and time and a half for over 40 hours, what would be the total labor cost of a job requiring 51 hours?

APPENDIX 8

1. True-False: The layout at the right could be used to divide a board into six equal parts.

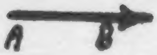


2. Lay-out a regular hexagon on the circle below.



3. If the radius of the circle is 18 inches, then what is the perimeter of the hexagon?

Appendix 8

Example 1: 

If ray AB is rotated one complete revolution,

through how many degrees is it rotated?

Example 2: 1° = _____ minutes; 1 minute = seconds.

Example 3: $3^{\circ}20'$ = _____ minutes.

Example 4: $5^{\circ}42'$ = _____ seconds.

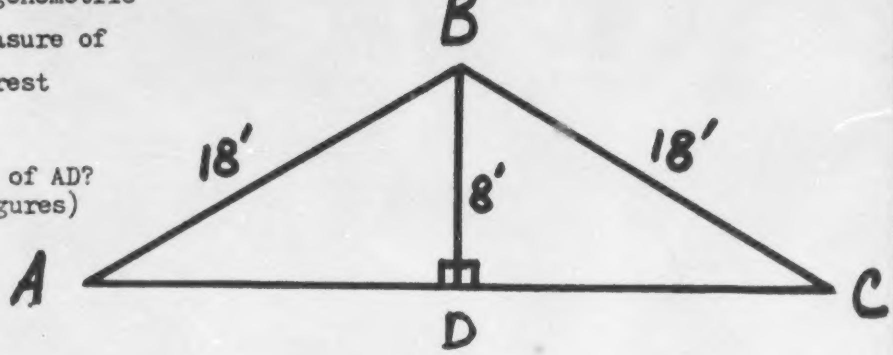
Example 5: 360° = _____ minutes.

= _____ seconds.

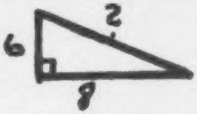
APPENDIX 9

Example 1: Using a set of trigonometric tables find the measure of Angle A to the nearest whole degree.

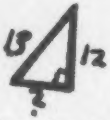
What is the length of AD? (4 significant figures)



Example 2: Find the hypotenuse of this right triangle:



Example 3: Find the missing side of this right triangle:



Example 4: Some triangles have sides whose measures are stated. Which of these are right triangles?

a) 3,4,5	d) 20,25,30
b) 4,7,8	e) 1,1,2
c) 15,20,25	f) 24,32,40

Appendix 9

Example 1: Add: $4^{\circ}20'$

$\underline{+\ 19'20''}$

Example 2: Add: 12°

$\underline{+\ \ 40''}$

Example 3: Add: $6^{\circ}40'$

$\underline{+\ 7'40''}$

Example 4: Add: $90^{\circ}00'00''$

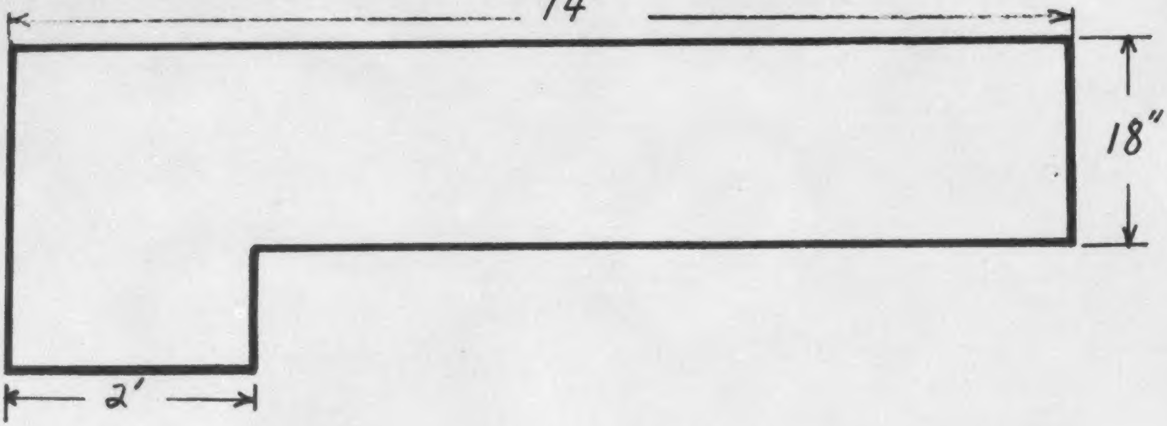
$131^{\circ}31'20''$

$89^{\circ}16'40''$

$84^{\circ}\ 3'40''$

$\underline{145^{\circ}10'00''}$

APPENDIX 10



Compute the number of square feet of formica required to cover the surface described above.

APPENDIX 11

John cuts off and does not use 5" by 4' of 10 pieces of plywood.

1. What is the total waste?
2. What fractional part of all the plywood is used?
3. What is the percentage of waste?
4. What per cent of the material is not wasted or used for the job?

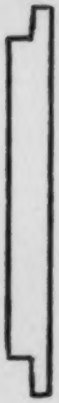
APPENDIX 12

You are preparing a material cost estimate for a cabinet job. Neatly itemize the following in the form of a bill statement. Do not figure labor costs.

10 sheets of 3/4" - 4' X 8' Plywood @ $9.58
6 sheets of 1/2" - 4' X 8' Plywood @ $7.76
128' of 3/4" X 2" Pine @ 11¢ per ft.
64' of moulding at 7¢ per foot (linear)
Stain and Deft Finish @ $4.88
16 knobs @ 22¢ each
16 catches @ 26¢ each
32 offset hinges @ 42¢ per pair
Additional costs in preparation - 10% of total cost
Tax - 4% of total

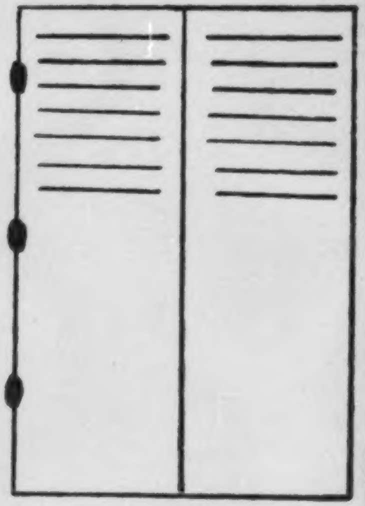
APPENDIX 13

The illustration at the right is a lipped cabinet door constructed from 3/4" plywood. If the opening to be enclosed is 26" high, what should be the length of plywood cut to allow for a 3/16" by 3/16" lip?



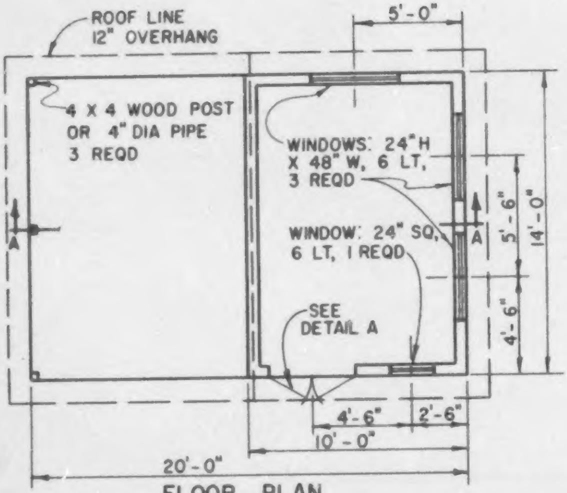
APPENDIX 14

The louvered door at the right is to be installed on a cabinet for storing canned goods. Three hinges will be installed . . . the top one 7" from the top and the bottom one 10" from the bottom. The middle hinge should be placed midway between the other two. If the hinges are 3" in width, where should they be placed on the door? List the distance of the top of each hinge from the bottom of the door.

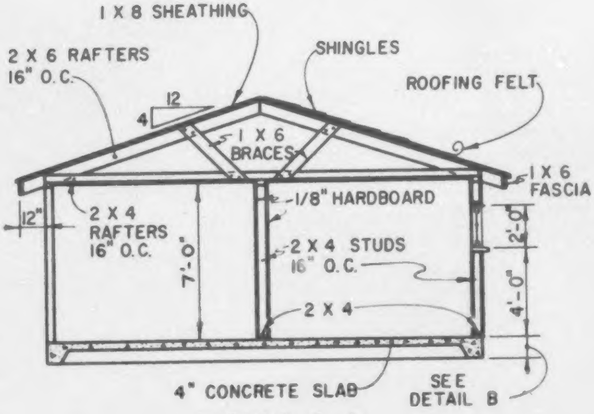


Appendices on Construction Group (Continued)

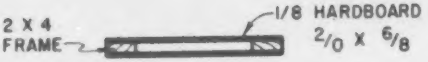
Appendix 15: You are planning to build a combination carport-garden house from the plan given.



FLOOR PLAN

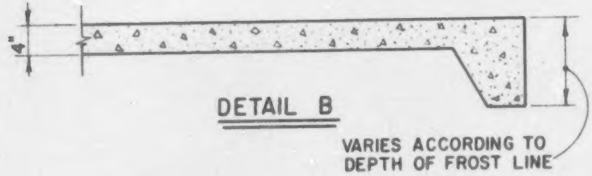


SECTION A-A

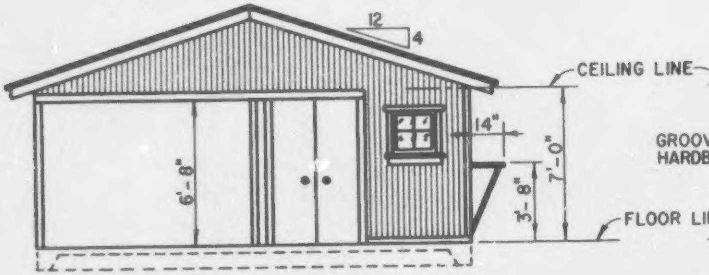


DETAIL A

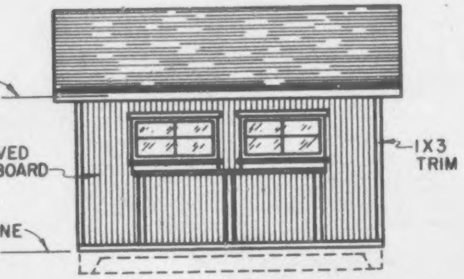
DOOR SECTION



DETAIL B



FRONT ELEVATION



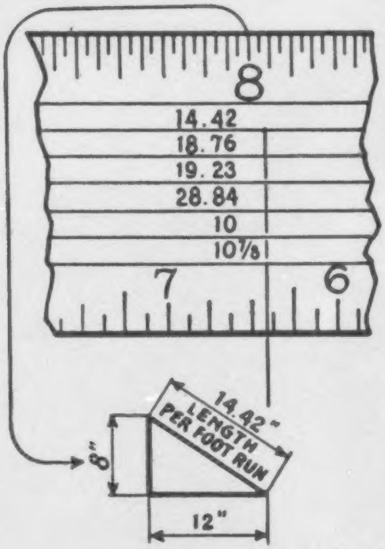
SIDE ELEVATION

1. What are the floor dimensions (complete)?
2. What are the floor dimensions of the carport?
3. What is the height (roughed-in) of the carport?
4. How high from the ground level are the windows?
5. What is the roof overhang?
6. What is the pitch of the roof?
7. What size rafters are recommended?
8. What size windows are planned?

Appendix 16: Using the Square

The illustration at the right is a "blow up" of the rafter table on a carpenter's square. If the pitch of a roof is to be 8" per running foot, how long must a rafter be if the run is 18 feet?

Same pitch but 24' run.



(Stanley Tools)

Using the rafter table to determine the length of a common rafter per foot of run.

Appendix 17: Interpreting Charts

The chart below describes casing nails. Study the chart and answer the questions.

Size	Length, in.	Gauge, no.	Dia., in.		Approx. no. per lb.
			Actual	Approx.	
2d	1	15½	0.0672	1/16	1,010
3d	1¼	14½	0.0760	5/64	635
4d	1½	14	0.0800	5/64	473
5d	1¾	14	0.0800	5/64	406
6d	2	12½	0.0985	3/32	236
7d	2¼	12½	0.0985	3/32	210
8d	2½	11½	0.1130	7/64	145
9d	2¾	11½	0.1130	7/64	132
10d	3	10½	0.1277	⅛	94
12d	3¼	10½	0.1277	⅛	88
16d	3½	10	0.1350	9/64	71
20d	4	9	0.1483	5/32	52
30d	4½	9	0.1483	5/32	46
40d	5	8	0.1620	5/32	35

1. What is the gauge no. of a 10d nail?
2. What is the actual and approximate diameter of an 8d nail?
3. How long is a 16d casing nail?
4. How many 12d casing nails are there (approx.) per pound?

APPENDIX 18: Grading Systems

1. If a student scored the following percentages on tests, what would be that person's average score? 83%, 77%, 95%, 68%, 98%

2. A teacher bases a unit's grade on the following criteria:

25%	Homework	($\frac{1}{4}$)
25%	Quizzes	($\frac{1}{4}$)
50%	Tests	($\frac{1}{2}$)

What would a student's unit grade (percentage) be who had a -

97%	Homework Average
74%	Quiz Average
83%	Test Average

3. On a shop safety test a student had 22 correct answers out of 25 questions. What percent correct answers did the student have?

4. Find the average of 188 feet and 192 feet.

5. Find the meaning of 768.24 ft. and 766.87 ft.

6. The first measurement of a distance was 347.62 f.

After the second measurement, the mean distance was found to be 348.16 ft. What must have been the second measurement?

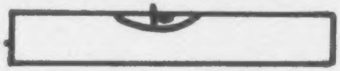
7. Find the mean of 511.37 and 511.32.

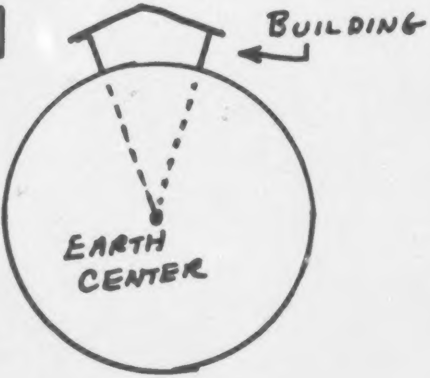
APPENDIX 19: Saws and Mathematics

1. What is meant when a saw has a 5° bevel back of a tooth?
2. Band saws should have an 8° to 15° hook on each tooth. Draw an illustration of this.
3. On a dado-head circle saw, the spur teeth are approximately ___________ inches longer than the raker teeth.
4. If a saw is rated as an eight-point cross cut, how many teeth per inch does it have?

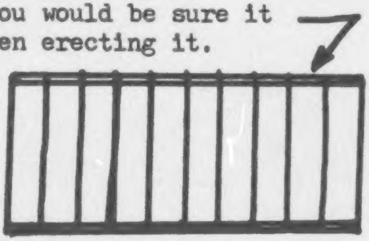
APPENDIX 20: The Plumb Bob, Square and Level (think carefully)

1. By definition, all vertical lines meet at the center of the earth. Are two vertical walls of a building parallel? (The walls are plumb.)
2. Study the level at the right. Which end is Low?





3. The drawing at the right illustrates a wall of a building that was "nailed-up" on the ground. Explain how you would be sure it is plumb and square when erecting it.



APPENDIX 21: Using a T-Bevel and a pencil only - redraw Figure A under the Figure B area.

Figure A

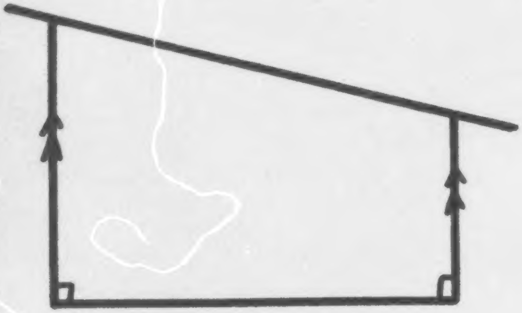
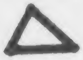
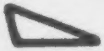
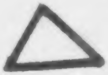
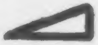
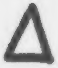


Figure B

Example Which of the triangles below appear to be similar to this triangle: 

a)  b)  c)  d) 

Example A triangle has sides with measures 5,7, and 8. Which of the following triangles are similar to it if their sides are given:

a) 7,8,10

b) 10,14,16

c) 20,28,32

d) 25,49,64

e) 2½,3½,4

Appendix 21

Example A triangle has sides with measures 3,5, and 6. Find the longest side of a similar triangle if the other sides measure 9, and 15.

Example Which of the following triangles would be similar to a 3:4:5 right triangle? (The numbers given are measures of the sides)

a) 6,8,10 c) 5,12,13 e) 30,40,50
b) 24,32,40 d) 1,1,2

APPENDIX 22: Planning a Floor of a Building

Problem: using 2 by 10's as floor joists, plan the framing of a floor over a basement 24' by 32' then cover it with construction grade plywood for sub-flooring. Have the joists by 16" on center. Plan also the bridging using 1 by 3's and the beams or girders. Sketch the plan and write a material list.

APPENDIX 23: Floor, Walls and Roof Construction

1. What is recommended height of ceilings and spacing of studs?
2. What is a "square" of roofing?
3. Using the square, find the board feet in two pieces of lumber 2" X 10" X 8'.
4. What is the proper length of a brace if the run on the plate or stud is 36 inches?

Construction Appendices Continued

Appendix 24

1. In order to produce Color X, it is required to use 2 parts of Color A, 3 parts of Color B and 5 parts of Color C. How many pints of colors A, B and C must be available to produce 2 gallons of Color X?

2. What is the ratio of Color A to Color B?

   What is the ratio of Color A to Color C?

   What is the ratio of Color B to Color X?

Appendix 25

1. A painter plans to paint the ceiling and 4 walls of a banquet room with dimensions 36' X 44' X 8'6". How much square footage is to be painted, deducting 6% for windows and doors?

2. If a gallon of paint will cover 500 square feet (approx.), how many gallons are estimated to do the job?

3. If the paint will cost $8.88 per gallon, what will be the cost of the paint for the job?

Appendix 26

1. A single roll of wallpaper covers approximately 30 sq. ft. When you allow for waste. How many rolls would be needed for a room 18' by 20' if it has an 8 foot ceiling? (Include 4 walls but no ceiling.

2. On the average, 1 roll of wallpaper can be deducted for every 2 openings. In problem 1, the room has 2 doors, 2 windows and 1 fireplace. How many fewer rolls are needed?

3. At $6.50 per roll, how much would the wallpaper in problem #2 cost?

Appendix 27

1. An upholsterer wishes to cover a stool seat with fabric. How much fabric is needed to cover the seat if it has a 14" diameter, a $\frac{1}{2}$" thick piece of foam rubber will be placed under the fabric and a one-inch lap is needed for tacking?

2. A desirable stitch for ordinary sewing is 20 stitches to the inch. How many total stitches would this make for a yard?

3. A pattern from a catalog is scaled 1" = 2'. How long is the actual arm of a sofa that is $2\frac{1}{4}$" in the catalog?

APPENDIX 28

You are working in an upholstery shop and have 10 poly foam cushions to redo. Each dimension is 20" X 26" X 4".

1. What is the cost of the poly foam if it is priced at 50¢ a square foot at a 20% discount?

POLY FOAM

We have 16 different sizes-6 widths and 6 thicknesses. We will cut to your size upon request. Camper cushions to 54" wide, pillow forms and shredded foam also included.

20% OFF

2. How many yards of fabric should be allowed for the job if 10% is to be added for lapping, etc?

APPENDIX 29

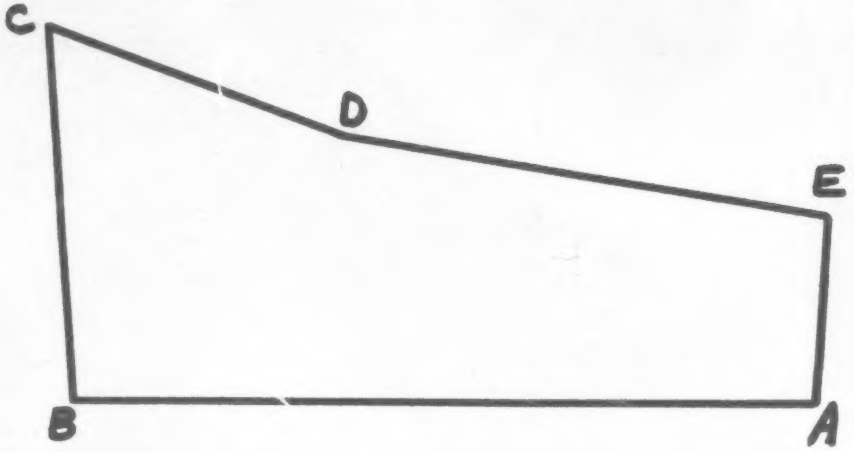
Wire for an upholstery job is listed 14 Ga. Premier .0171 pounds per foot.

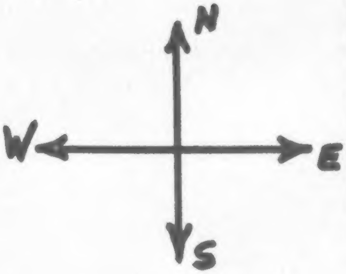
1. How much would 1000 feet of the wire weigh? 750 feet? 850 feet?

2. How much would a 5000 foot spo[illegible]f this wire cost at the rate of $1\frac{3}{4}$¢ per foot?

APPENDIX 30

1. Give the Azimuth of each line below using the points as reference.

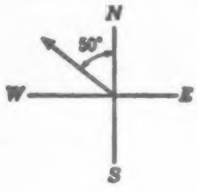




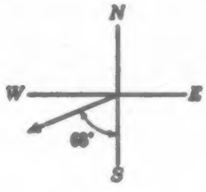
Low Precision
Magnetic North

2. Read the bearings of the lines marked by arrows in E through H.

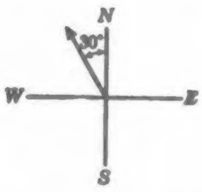
E



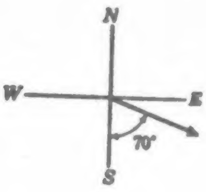
F



G



H



1. Fig. E ____________

2. Fig. F ____________

3. Fig. G ________________

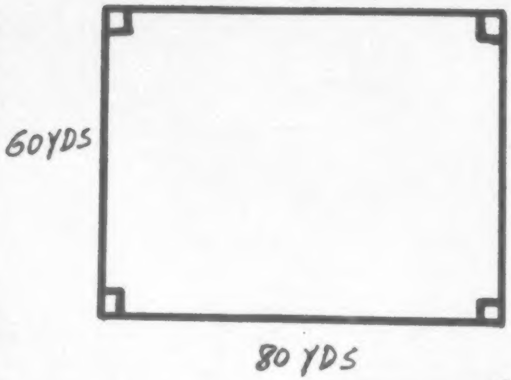
4. Fig. H ________________

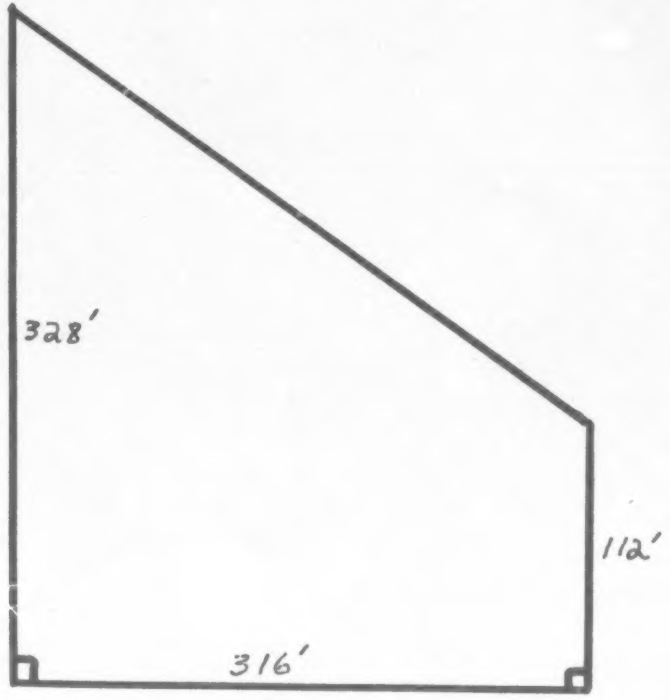
APPENDIX 31

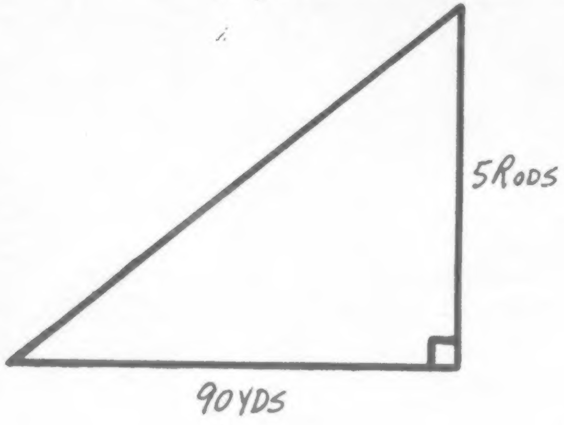
The figures below are representations of plots of ground to be surveyed.

1. What is the area of each plot in square footage?

2. What is the area of the largest plot in acres?



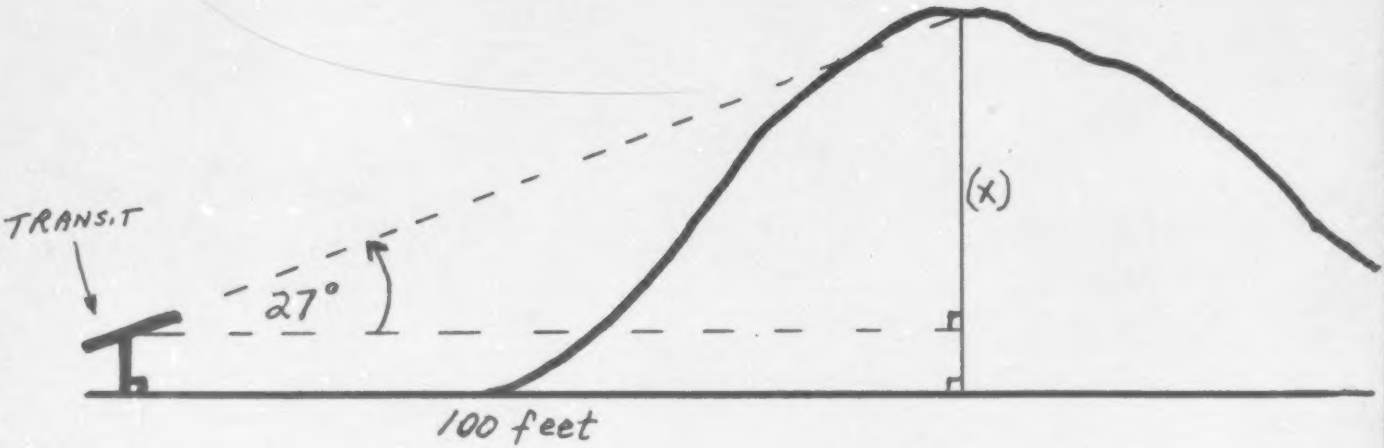




APPENDIX 32

Determine the height of the hill (X).

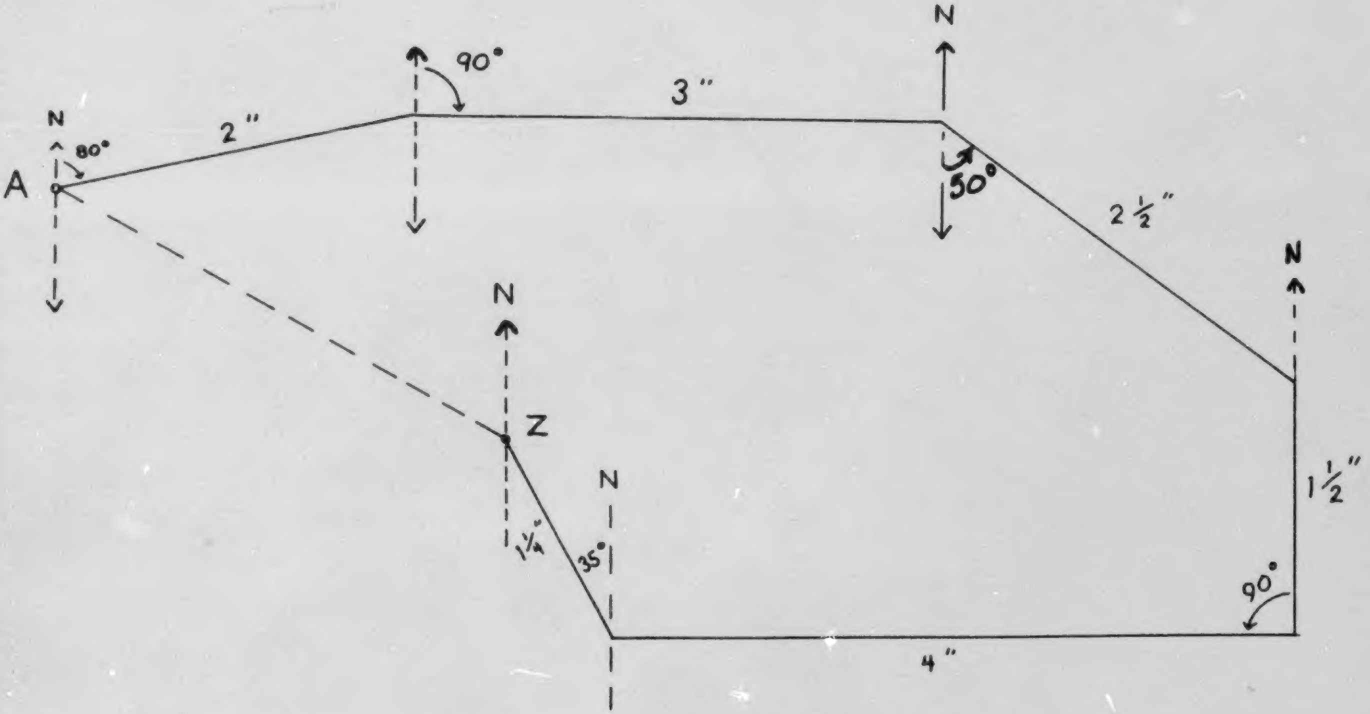
(The Transit is 5' off the ground)



APPENDIX 33 (Scale Drawings)

Below is a drawing of a piece of property. Give a description of the property, as in the last problem, by giving directions and distance from each point starting at A. Scale: 1" = 50'

No. 1



Appendix 33 Continued

SURVEYOR

No. 2

Combining a knowledge of bearings with that of scales, draw a diagram of the following property. The description begins from point A (northwest corner of property). (Use a protractor for measuring angles, a ruler for units. The scale is 1" = 50'.) From point A go N 45° E 100'; then S 90° E 150'; then S 45° E 125'; the S 0° 100'; then N 85° W 300'.

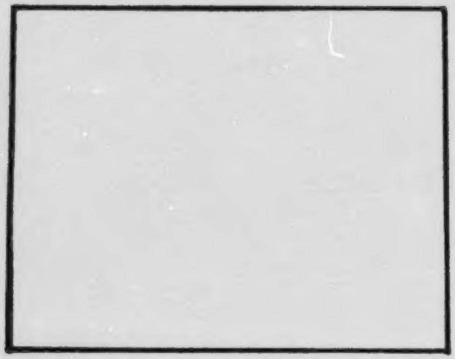
Example: A rectangular plot 16' by 24' could be scaled down to 16" by 24"

No. 3 on the drawing. The scale would be 1" = 1'. If the scale was 2" = 1', the drawing would be 32" by 48". If another plot of land was 75' by 30' and the scale for it is 1" = 5', the scaled drawing would be ______________________________

Appendix 33 (Continued)

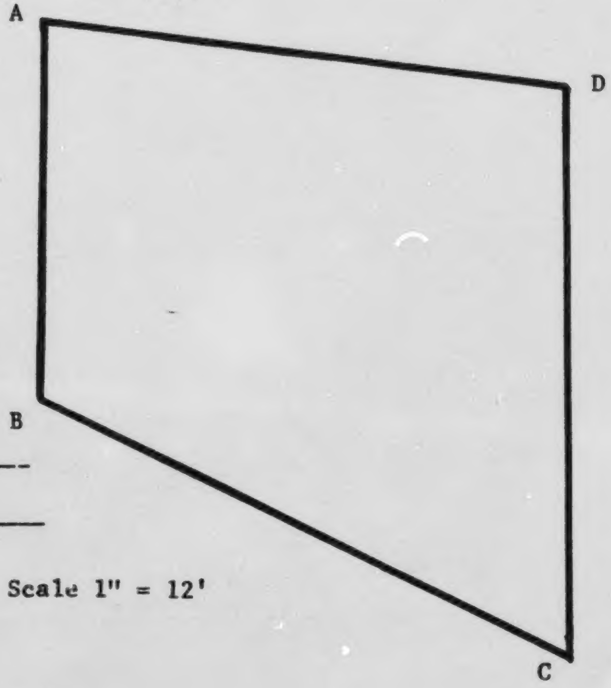
4. Find the actual length of each side of each of the following figures. Use a ruler to find the lengths of each line segment, then determine the actual length by using the given scale

fig. A



Scale 1" = 10'

fig. B



Scale 1" = 12'

b. Actual size of figure A L= _____ W = _____

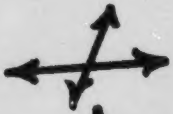
c. Actual size of figure B AB=________ BC=______

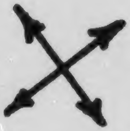
CD=________ DA=___________

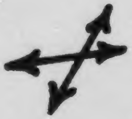
Appendix 34

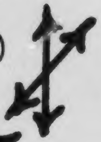
Example 1: If two lines are perpendicular, they form an angle of _____ degrees.

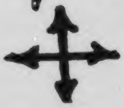
Example 2: Which of the following appear to be examples of perpendicular lines?

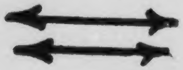
a) 

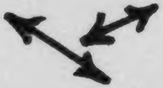
b) 

c) 

d) 

e) 

f) 

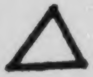
g) 

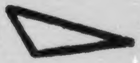
Appendix 35

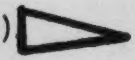
Example 1: A triangle is called a right triangle if one of its angles has a measure of _____ degrees.

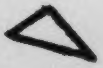
Example 2: The side opposite the 90° degree angle in a right triangle is called the ____________________.

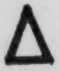
Example 3: Which of the following appear to be right triangles?

a) 

b) 

c) 

d) 

e) 

Appendix 36

Example 1: State the formula for finding the sum of the measures of the interior angles of an n-sided polygon.

Example 2: The sum of the measures of the interior angles of an n-sided polygon is given by the formula:

$s = (n-2)\ 180^{\circ}$

Find the sum of the interior angles of the following polygons:

a) rectangle
b) hexagon
c) 9-sided polygon

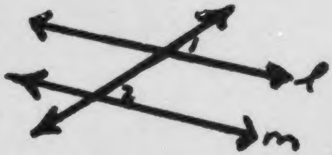
Appendix 37

Example 1: Divide $4^{\circ}40'00''$ by 4.

Example 2: If five angles were measured and an error of of $1'40''$ occured, what was the average error per angle?

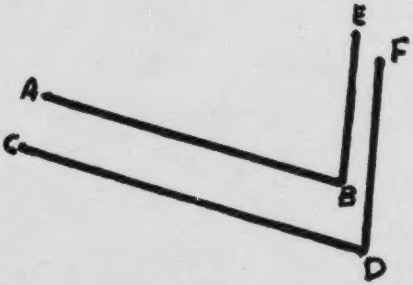
Appendix 38

Example 1: If $1 \parallel m$, and $\angle 1 = 50^{\circ}$, find the measure of $\angle 2$.



Example 2:

If $\overline{AB} \parallel \overline{CD}$ and $\overline{BE} \parallel \overline{DF}$, and if $\angle CDF - 80^{\circ}$, what is the measure of ABE?



Appendix 39

Example 1: Add: 1224.77 + 8.31 + 1.92 + 4.27.

Example 2: Subtract: 923.75 - 8.87

Example 3: Do the following computation:

704.38 + 9.32 - 8.75 - 3.87 - 1.93 - .50 + 12.29.

Appendix 40

Example 1: Subtract:

$$\begin{array}{r} 361^{\circ}10'20' \\ -\ \underline{360^{\circ}\qquad} \end{array}$$

Example 2: Subtract:

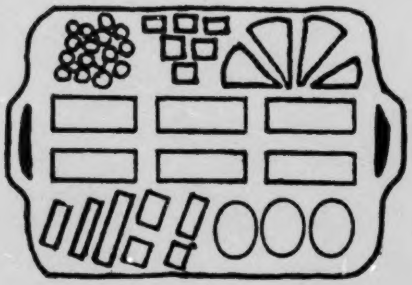
$$\begin{array}{r} 720^{\circ} \\ -\ \underline{719^{\circ}1'40''} \end{array}$$

Example 3: The sum of the measures of five angles should be 540°. The actual measure was $539^{\circ}59'$. Find the error in measurement.

Appendix 41: In a surveying course one student measured Angle A to be $28^\circ\ 15'\ 26''$ but another student measured $28^\circ\ 17'\ 12''$.

1. What is the difference between the two measures?
2. What is the average of the two measures?

HOSPITALITY



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WHAT IS THE HOSPITALITY CLUSTER?

Hospitality careers include food service and preparation, food management, and hotel and motel careers. Employment opportunities are many and varied, and are increasing yearly. People who work in this cluster, help meet the leisure time needs of people of all age groups. Educational requirements vary from on-the-job training to extensive post-secondary and graduate work. Hospitals, care facilities, restaurants, business, industry and schools employ food service personnel as dietary aids, chefs, managers, cafeteria workers, waiters, and waitresses.

SUGGESTED COURSE OFFERINGS
LEADING TO OCCUPATIONS
IN THE
HOSPITALITY AREA

CATERING AND FOOD MANAGEMENT TRAINEE

Suggested Courses:
- Food Service Management I
- Food Service Management II
- Food Service Management III

FOOD PREPARATION AND WAITER/WAITRESS

Suggested Courses:
- Restaurant Food Service I
- Restaurant Food Service II
- Restaurant Food Service III

FOOD MANUFACTURING CAREERS

Suggested Courses:
- Introduction to Food Manufacturing
- Food Production and Quality Control
- Food Processing and Logistics Management

Cluster Hospitality

Occupation

Guide Introduction to Food Manufacturing #9900

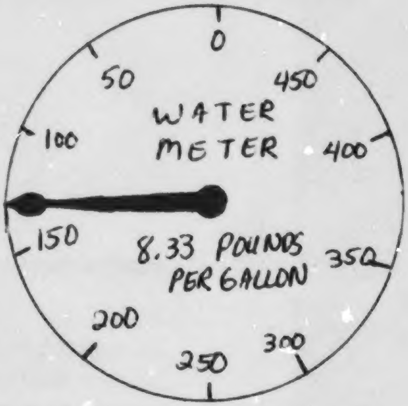
OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

Sht 282 of

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Read decimal and fractional numbers, tables	General Math	Read a digital scale, read temperature dials, water meter, use table to find portions and adjust recipes.	Science, Social Studies See Appendix Problem 1	
Operations with whole fractional, decimal numbers, rounding	General Math	Portion control, changing receipe size.	Science. See Appendix Problems 2, 3	
Conversions of measures	General Math	Change measures in a recipe	Science, Home Economics See Appendix Problem 4	
Helpful - metric measures of weight, volume	General Math	Use metric recipes.		
Proportions	General Math	Convert recipes, read floor plans of food plants	Art, Science See Appendix Problem 3	

APPENDIX



Example 1: Approximately how many pounds of water is indicated?

Example 2: How many quarts of salad are needed to serve 40 people, using #6 dipper?

Example 3: A recipe for 50 calls for 2 pounds flour. How much would you use for 70 people?

Example 4: 6 oz. is what part of a cup?

Cluster Hospitality

Occupation

Guide Restaurant Food Service I #9855

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

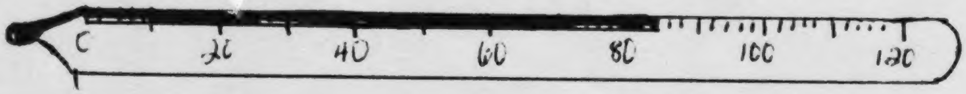
MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 284 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Read thermometer (F,C)	Basic math Concepts	Identify food storage temperatures, check temperature on items cooking See Appendix Notes 1,2	Sciences	
Measure volume (English, metric) (use fractional Measures)	Basic math Geometry	Measure detergents, measure ingredients See Appendix Note 3	Sciences	
Tell time, read timers	Basic math	Follow a time plan to prepare food. time cooking and baking See Appendix Note 4		
Count back change	Basic math Business math	Operate a cash register and make change See Appendix Note 5		
Add, subtract whole numbers, decimals (use of calculators)	Basic math	Adding a bill See Appendix Note 6		
Multiply decimals, use tables	Basic math Geometry Business math	Figuring tax See Appendix Notes 6,9	Business/Economics	
Divide, multiply fractions and whole numbers	Basic math	Increasing or decreasing a recipe, converting measures See Appendix Notes 7,8	Chemistry	

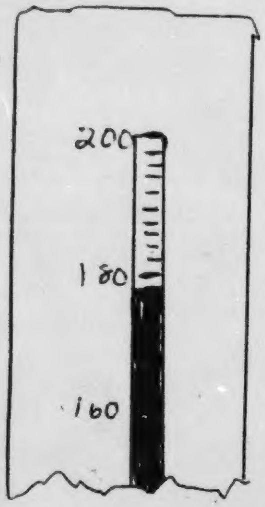
NOTES ON HOSPITALITY, RESTAURANT FOOD SERVICE I, 9855

1. Read the temperature shown on the Farenheit thermometer: (84° F.)



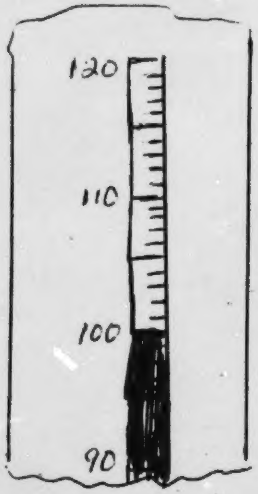
2. Read the temperatures shown on the Celsius thermometers:

A.



178° C

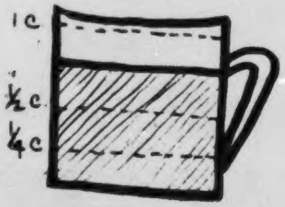
B.



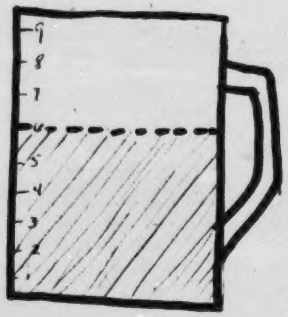
100° C

Which is nearer the boiling point of water?
(B)

3. Read the measurements shown on these measuring cups:



A ____________
(3/4 Cup)



B. ____________
6 oz.

4. Select a menu for an informal luncheon and write a time plan for preparing the meal, telling the steps you will follow and the time schedule. There will be 24 guests.

5. Complete the form by showing the number of pieces of each denomination given to the customer.

AMOUNT RECEIVED	AMOUNT OF SALE	1¢	5¢	10¢	25¢	50¢	$1	$2	$5
$10.00	$5.37	3		1		1	4 o	2	
5.00	2.17	3	1		1	1	2		
10.00	3.49	1				1	1		1
5.00	1.66	4	1		1		1	1	
10.00	3.22	3			1	1	1		1

6. Sam had a shrimp cocktail for $2.50, a steak dinner for $7.95, coffee for 30¢, milk for 25¢, and ice cream for 45¢. Write up the bill adding 4% sales tax. Waitress is number 7.

O. K. DINER		
Shrimp Cocktail	2	50
Steak	7	95
Coffee		30
Milk		25
Ice Cream		45
SUB	11	45
Server 7 TAX		46
TOTAL	11	91

7. Change this recipe for 50 portions to a 30 portion recipe:

Rice (raw) 1 2/4 bls. (28 oz.) Ham (cooked) 8 lbs. Cheese sauce 5 qts.	(rice 1 lb., 1 oz., ham 41b., 13 oz., cheese sauce 3 qts.)

8. A recipe takes 2t. soda. If you quadruple (4 times) the recipe, how many tablespoons and teaspoons will it take? (2T. 2t.)
The same recipe calls for ½ lb. brown sugar. One pound is 2 2/3 C. How many cups will it take whe
when you convert the recipe? (5 1/3C.)

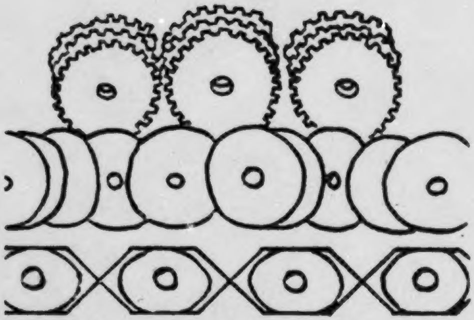
9. MINNESOTA TAX TABLE

Amount of Sale	Tax
$.01 through $.12	no tax
$.13 through $.37	1¢
$.38 through $.62	2¢
$.63 through $.87	3¢
$.88 through $.99	4¢

Use the tax table and the fact that sales tax is 4% to complete the chart below:

Amount of Sale	Tax	Total Sale
$.98	.04	$1.02
$3.00	.12	3.12
$7.49	.30	7.79
$16.63	.67	17.30
$20.09	.80	20.89

MANUFACTURING



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WHAT IS THE MANUFACTURING CLUSTER?

It is the study of the processes and socioeconomic contributions of industries concerned with the creation of durable consumer products. Learning experiences are developed around functions or concepts of industry and include research and experimentation, product design and development, personnel organization, fabrication (custom and mass), distribution and occupations.

Students are assisted to identify and evaluate their interest, abilities, value judgments and needs as they relate to manufacturing and its place in society. Students who desire may gain a marketable skill in one or more of the many occupations in manufacturing.

Instructional areas include machine repair, jewelry, plastics, sheet metal, welding, foundry, metalworking, and machine operation.

SUGGESTED COURSE OFFERINGS
LEADING TO OCCUPATIONS
IN THE
MANUFACTURING AREA

INDUSTRIAL MACHINE REPAIRMAN

Suggested Courses:
- Machining and Tooling Metals I
- Machining and Tooling Metals II
- Machining and Tooling Metals III
- Basic Welding I
- Industrial Machine Repair I
- Industrial Machine Repair II

JEWELER (MANUFACTURING)

Suggested Courses:
- Jewelry Manufacturing I
- Jewelry Manufacturing II
- Jewelry Manufacturing III

MACHINIST TRAINEE

Suggested Courses:
- Machining and Tooling Metals I
- Machining and Tooling Metals II
- Machining and Tooling Metals III
- Machine Shop I
- Machine Shop II
- Machine Shop III

PLASTIC MACHINE OPERATOR

Suggested Courses:
- Machining and Tooling Metals I
- Plastic Technology I
- Plastic Technology II

PLASTIC MOLD-MAKER TRAINEE

Suggested Courses:
- Machining and Tooling Metals I
- Machining and Tooling Metals II
- Machining and Tooling Metals III
- Machine Shop I
- Machine Shop II
- Machine Shop III
- Plastic Mold Making I
- Plastic Technology I

SHEET METAL WORKER

Suggested Courses:
- Industrial Metals
- Sheet Metal I
- Sheet Metal II
- Sheet Metal III

WELDER

Suggested Courses:
- Industrial Metals
- Basic Welding
- Oxyacetylene Welding
- Arc Welding
- Advanced Welding

Cluster Manufacturing

Occupation

Guide Industrial Machine Repair I
#9705

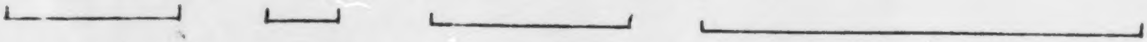
OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

Sht 291 of

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement (steel rule to 1/64", metric, decimal fractions of inch)	General Math	Read and draw simple sketches. Determine screw pitch. See Appendix Problems 1, 2, 4.	Science	
Use compass and straightedge, know angle measures	Geometry	Using layout tools (copy an angle, make a circle of given diameter or radius, find diameter of circle from an arc, divide a circle into six equal parts, make parallel lines perpendicular lines, bisect an angle), cutting angles. See Appendix Problems 3, 4.	Science, Art	
Convert fractions to decimals	General Math	Measurement of patterns and materials, screw pitch. See Appendix Problems 2, 4.	Science	Use a decimal equivalents table
Read a scale in decimals	General Math	Read a micrometer. See Appendix Problem 5.	Science, Economics	
Use whole numbers, fractions decimals	General Math	Calculate cutting speed. See Appendix Problems 1, 2,5.	Science	
Substitute in formula, square number	Algebra I	Calculate cutting speed, feed, tailstock setover, woodruff keyway calculations, speed and feed for surface grinder, mill. See Appendix Problems 6, 7, 8, 9, 10.	Science	
Metric - English conversion	General Math	This is helpful. As metric system is used more widely. See Appendix Problem 8.	Science	

Example 1: Use a steel rule to measure these to the nearest 1/8, 1/16, 1/32 in. and a metric rule to measure to the nearest mm.



A ________ B ________ C ________ D ____________

________ ________ ________ ____________

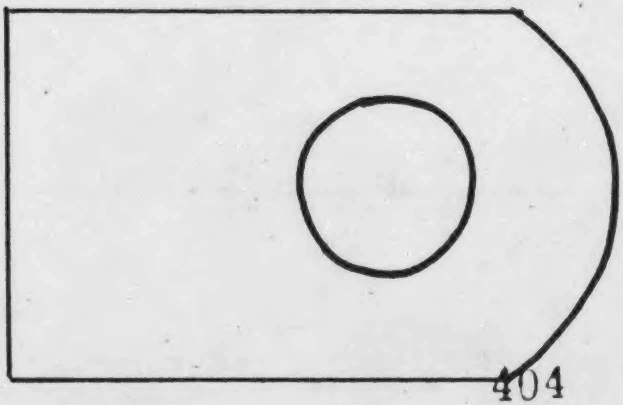
________ ________ ________ ____________

________ ________ ________ ____________

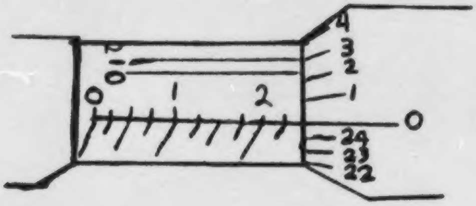
Example 2: A screw has 8 threads per inch. What is the pitch?

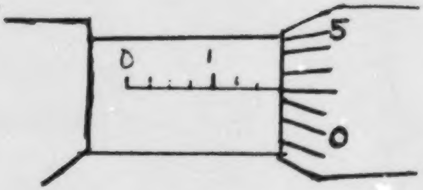
Example 3: Construct a circle of radius 2". Cut it into six equal wedges.

Example 4: Copy the pattern below. Label the measures in 1/8" and in mm.

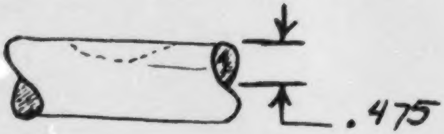


Example 5: What are the micrometer readings shown?





Example 6: A 3 inch diameter shaft will have a .25 inch-wide woodruff keyway cut to dimensions given in sketch below. What total depth must cutter be fed?



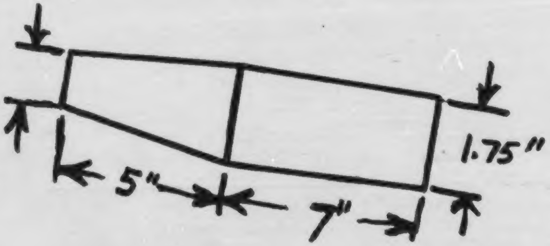
Example 7: Find the rpm of a 3 inch diameter brass bar turned on a carbide tool. (The table gives starting speed as 800.)

Example 8: A high speed drill is used on a low-carbon steel bar. 3 inches in diameter. Cutting speed is 36m. Find the rpm in both m/min and ft/min.

Example 9: Find the rpm and feed rate:

SFM	Dia. of Cutter	Type of Material	Chip Load	No. of Teeth	RPM	Feed Rate
800	6"	MC Steel	.010	16		
75	6"	MC Steel	.007	14		
100	3 3/4"	IC Steel	.009	12		

Example 10: Compute the tailstock offset



Cluster Manufacturing

Occupation

Guide Industrial Machine Repair II
#9706

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

Sht 295 of

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement (steel rule to 1/64", metric, decimal fractions of inch- to .001 inch.	General Math	Read and draw simple sketches, determine screw pitch. See Appendix Problems 1, 2, 4.	Science	
Use compass and straight edge, know angle measures.	Geometry	Use layout tools (copy on angle, make a circle of given diameter or radius, find diameter of circle from an arc, divide a circle into six equal parts, make parallel lines perpendicular lines, bisect an angle, cut angles. See Appendix Problems 3, 4.	Science, Art	
Convert fractions to decimals.	General Math	Measurement of patterns and materials, screw pitch. See Appendix Problems 2, 4.	Science	Use decimal equivalents table
Read a scale in decimals	General Math	Read a micrometer, set arc welder. See Appendix Problems 5, 14.	Science, Economics	
Use whole numbers, fractions decimals	General Math	Calculate cutting speed. See Appendix Problems 1, 2, 5, 11, 12, 13, 14, 15.	Science	
Substitute in formula square number	Algebra	Calculate cutting speed, feed, tailstock setover, woodruffkeyway calculations, speed and feed for surface grinder, mill. See Appendix Problems 6, 7, 8, 9, 10.	Science	

Cluster Manufacturing

Occupation

Guide Industrial Machine Repair II #9706

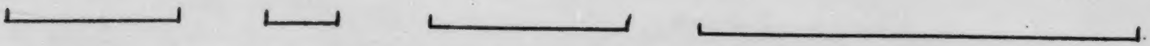
OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

Sht 296 of

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Formula (continued)		Calculate spur gear formula and cutting speed of shaper. Perform Helix angle calculations and bevel gear calculations. See Appendix Problems 12, 13, 14.		
Use of trig functions	Trigonometry	Do bevel gear and helix angle calculations. See Appendix Problems 12, 13.	Science	
Ratio and Proportions	General Math Algebra Geometry	Make gear ratio, gear calculations. See Appendix Problems 11, 12.	Science, Art, Home Economics	
Metric - English conversion	General Math	This is helpful, as metric system is used more widely. See Appendix Problem 8.	Science	

Example 1: Use a steel rule to measure these to the nearest 1/8, 1/16, 1/32 in. and a metric rule to measure to the nearest mm.



A ________ B ________ C ________ D ________

________ ________ ________ ________

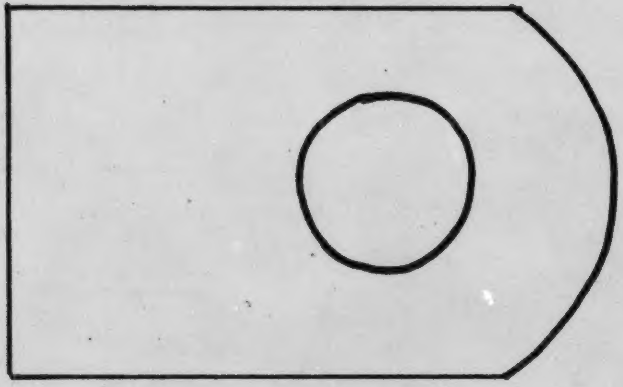
________ ________ ________ ________

________ ________ ________ ________

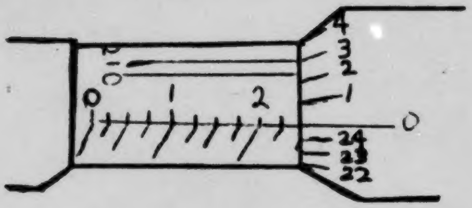
Example 2: A screw has 8 threads per inch. What is the pitch?

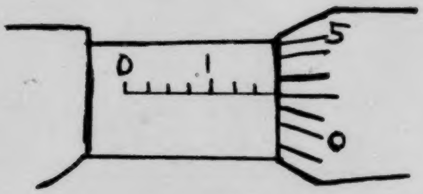
Example 3: Construct a circle of radius 2". Cut it into six equal wedges.

Example 4: Copy the pattern below. Label the measures in 1/8" and in mm.

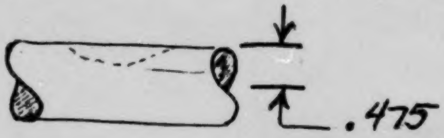


Example 5: What are the micrometer readings shown?





Example 6: A 3 inch diameter shaft will have a .25 inch-wide woodruff keyway cut to dimensions given in sketch below. What total depth must cutter be fed?



Example 7: Find the rpm of a 3 inch diameter brass bar turned on a carbide tool. (The table gives starting speed as 800.)

Example 8: A high speed drill is used on a low-carbon steel bar 3 inches in diameter. Cutting speed is 36m. Find the rpm in both m/min and ft/min.

Example 9: Find the rpm and feed rate:

SFM	Dia. of Cutter	Type of Material	Chip Load	No. of Teeth	RPM	Feed Rate
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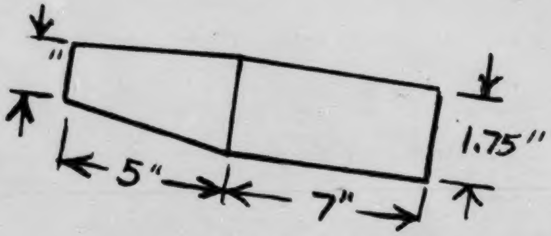
100	3 3/4"	IC Steel	.009	12		

Example 10: Compute the tailstock offset



Example 11: Brown & Sharpe standard change gears have the following number of teeth: 24 (two gears), 28, 32, 40, 44, 48, 56, 64, 72, 86 and 100. A gear ratio of 5:8 has been computed for differential indexing. Select gears for simple gearing.

Example 12: Calculate the dimensions for drawing and machining two meshing spur gears. Center-to-center distance is 3.9 in. Gear ratio 2:1. Choose size of hole, face, pitch.

	Pitch diameter	
	Addendum	
	Dedendum	
	Diameter of hole	
	Keyway	
	Face	
	Outside diameter	
	Pitch	
	Chordal thickness	
	Corrected addendum	
	Number of teeth	
GEAR		PINION

Example 13: The spur gears in Example 12 on preceding page are replaced with helical gears. Center distance of the shafts and size of teeth are not changed. Calculate the gear dimensions.

	Helix Angle	
	Pitch diameter	
	Addendum	
	Dedendum	
	Diameter of hole	
	Keyway	
	Face	
	Outside diameter	
	Pitch	
	Chordal thickness	
	Corrected Addendum	
	Lead	
GEAR		PINION

Example 14:

Material	Cutting Speeds in fpm Roughing	Finishing
Cast Iron	60	100
0.10 to 0.20 carbon	80	120
0.20 to 0.40 carbon	60	100
Die steel	40	40
Hard bronze	60	100
Brass	150	Max.
Aluminum	150	Max.

(The Cincinnati Shaper Co.)

Use the chart to find the number of strokes per minute of a shaper cam. Material is 0.10 carbon, roughing; length of stroke is 9 inches.

$(N = \frac{CS \times 7}{L})$

Example 15: Complete the table about gears.

Outside diameter	No. of Teeth	Diametral Pitch
3.600	14	
7.500		10
	34	18

Clus[illegible] Manufacturing

Occupation

Guide Industrial Metals #8483

OCCUP[illegible]IONAL EDUCATION INTERRELATED CURRICULUM PROJECT

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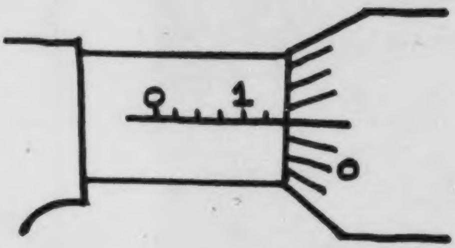
MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement to 1/32 inch, to .001 understandard	General Math	Measure with a steel rule, micrometer, read blueprints or patterns.	See Appendix problems 3, 4, 5	
Use decimals, fractions, whole numbers	General Math	Read a micrometer, make calculations for a taper.	See Appendix Probs. 1,2,5,6,7	
Angle measure	General Math Intuitive Geometry	Make angles on projects		
Substituting in a formula	Algebra	Calculate set over (for taper turning)	See Appendix Probs. 6, 7	
Metric measurement and conversion	General Math	Measure and make, metric patterns	See Appendix Problem 4	

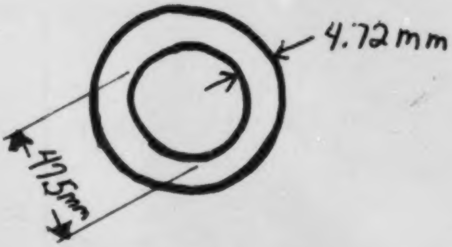
Appendix

Example 1:



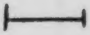
What is the micrometer reading?

Example 2:



Find the outside diameter.

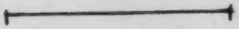
Example 3: Measure to the nearest 1/32 in., convert to decimals; measure to the nearest mm.



A. ______

______

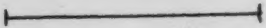
______



B. ______

______

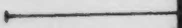
______



C. ______

______

______



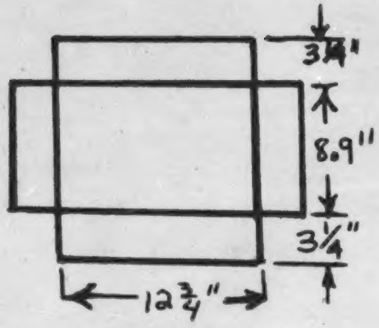
D. ______

______

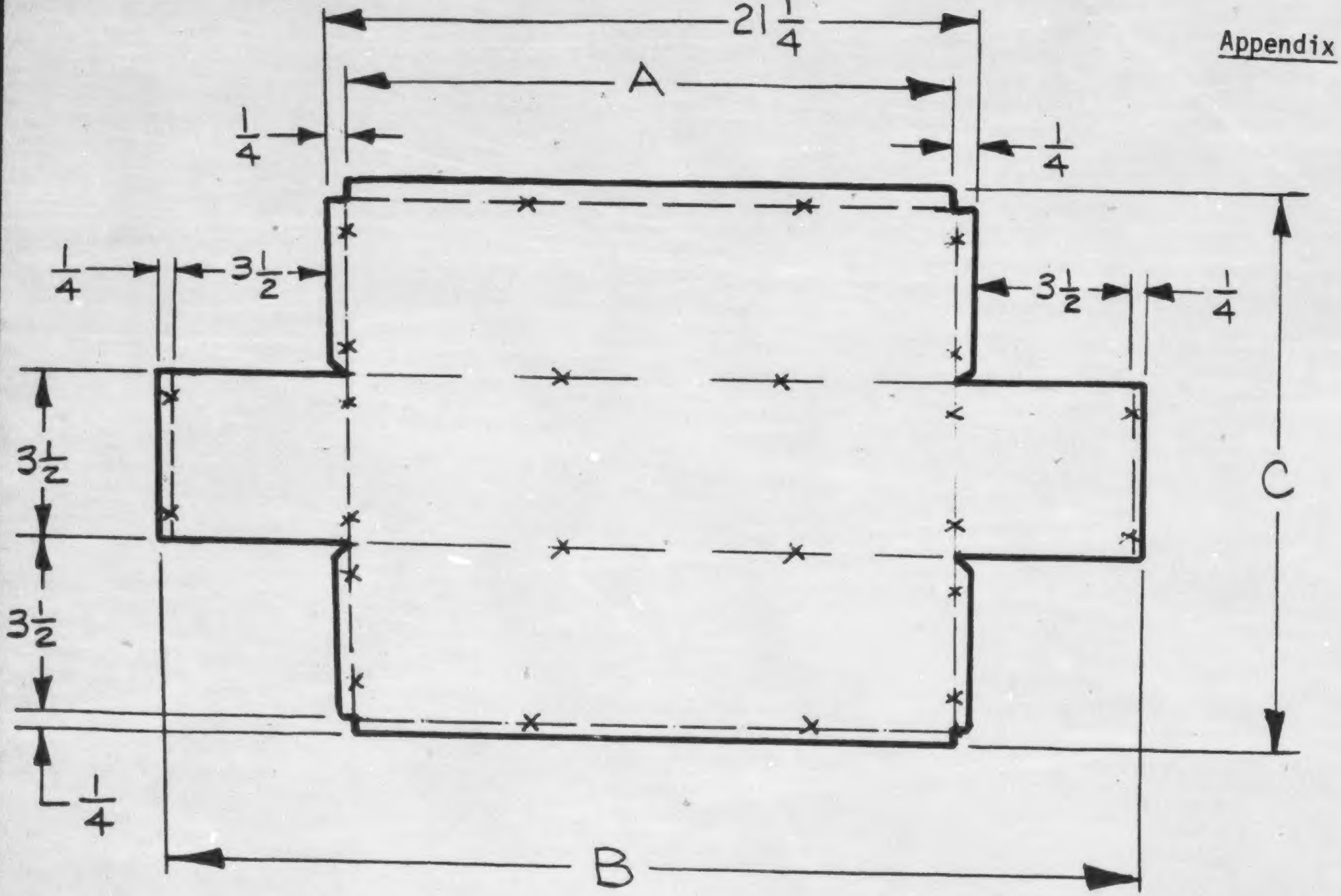
______

Appendix

Example 4:



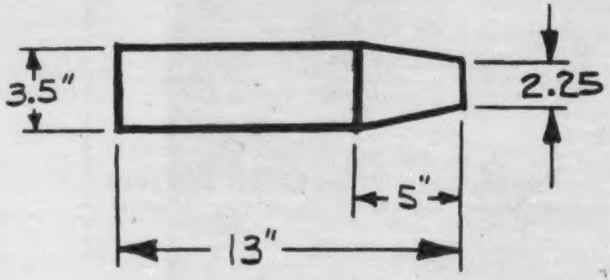
Redimension in metric system.



Example 5: Find A, B, C

Example 6: Find the taper per foot of a piece 3 inches long. The small end diameter is 1½", and the large end diameter is 2½".

Example 7: Find the setover.



Cluster Manufacturing

Occupation

Guide Jewelry Mfg. I #9720

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 308 of

Math Concept Taught	Course No. and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurements (millimeters, fractional inches)	General math Geometry	Measuring metal to make tubing using a gauge to measure metals See Appendix Note 1	Sciences	
Proportion and scale	General math Geometry Concepts	Making a design, preparing pickle See Appendix Notes 2,3,4	Sciences Art	
Basic geometric shapes (using templates, french curves, rounds, and ovals)	General math Geometry Intuitive geometry	Making a design See Appendix Note 4	Sciences Art	
Fractions	General math	Tubemaking, figuring designs, measuring materials See Appendix Notes 1,5		

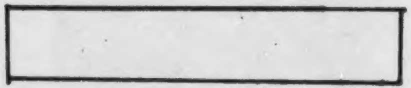
NOTES ON PERSONAL SERVICES, JEWELRY MANUFACTURING I, #9720

1. Measure the lengths and widths of the metal strips illustrated, first in millimeters, then in inches.

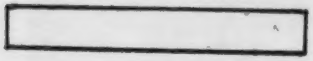
lengths= A.__________ __________ B.__________ __________

width= A.__________ __________ B.__________ __________

A.



B.

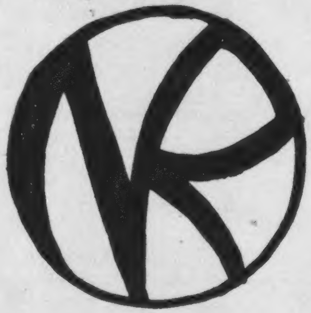


2. If I used ½ cup sulfuric acid to make a pickle, how much water do I need?

____

3. Draw a design for an initial ring in the scale 2in.:½ in.

4. The ring front below is in the scale 1 in:6 mm. What is the diameter of the ring front?



5. What would the completed tube diameter of a strip A. 3 cm wide be? B. a strip ¼" wide?

__________ __________

Cluster Manufacturing

Occupation ______

Guide Machine Shop I #9702 and II

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

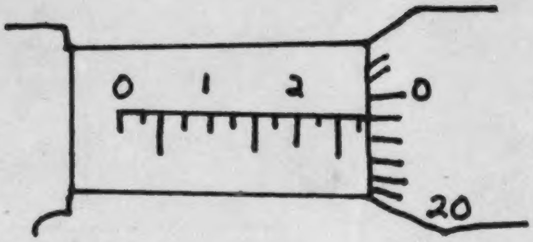
Sht 310 of ____

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement (fractions of inch, decimals, metric)	General Math	Read a micrometer, caliper, gauges, dial indicator, sine bar, pyrometer and heat-testing machines. See Appendix Problem 1.	Science	
Substitution in formula	Algebra	rpm (setting speed and feed), calculate setover, (taper turning). Calculate speed and feed. See Appendix Problems 2,3 4, 5, 6, 7, 8, 12.	Science	
Know types of angles, angle size, basic geometric terms	Intuitive Geometry	Tapers, screw threads, adjust cutting machine. See Appendix Problems 8,9,10	Science	
Proportions	General Math	Interpret and make scale drawings. See Appendix Problems 13,14,15,16,17	Science	
Use fractions, decimals, convert	General Math	Interpret scaled drawings, read blueprints, calculate values of formulae, make centering allowances, read Vernier scale. See Appendix Problems 1,11		
*Use tangent tables. Understand trig. functions.	Trigonometry	Metric system taper calculations. *This is not essential, but enrichment. See Appendix Problems 8,10		

Appendix

Example 1:



What is the micrometer reading?

Example 2: Calculate the R.P.M. of a 3" drill, drilling at 32 feet per minute.

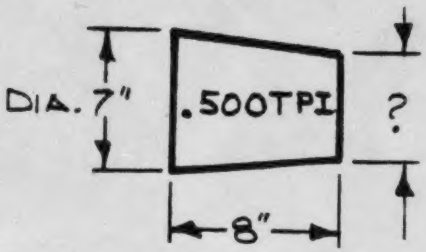
Example 3: Given the following facts, calculate the R.P.M. and feed rate:

(Surface - 46m/min, diameter of cutter - 76.15mm, chip load -.05 mm, 4 teeth).

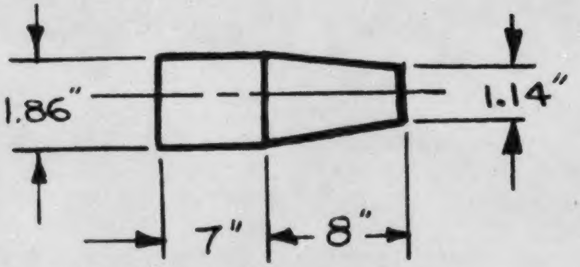
Example 4: What drill size would leave reaming stock in a hole for a 4/0 taper pin? Pin length 5/8 inch.

Appendix

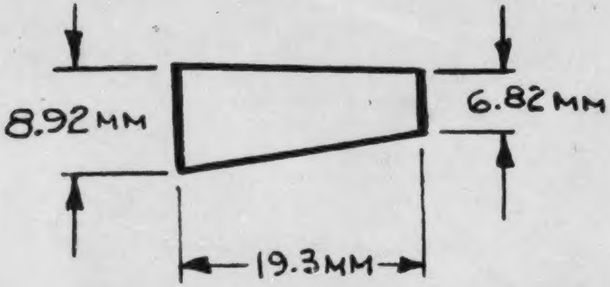
Example 5: Find the missing dimension.



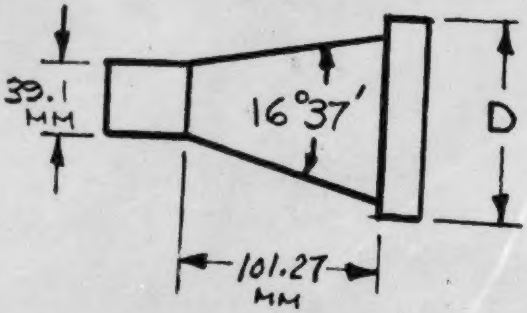
Example 6: Find the T.P.M.



Example 7: Find the tailstock offset.



Example 8: Find D on this French blueprint.



Example 9: What is the pitch of a thread if there are 32 threads per inch? What is the single depth?

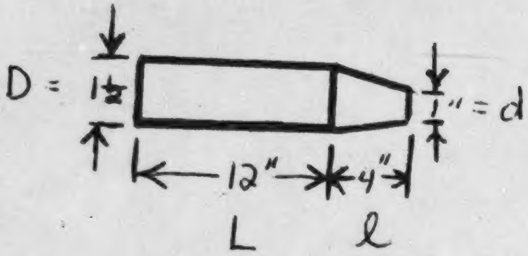
Example 10: What is the tap drill for a 3-mm bolt with a .60 mm pitch? Use the formula American T.D.S. =

$$(\text{O.D. mm} - P_{\text{mm}}) \times .0394$$

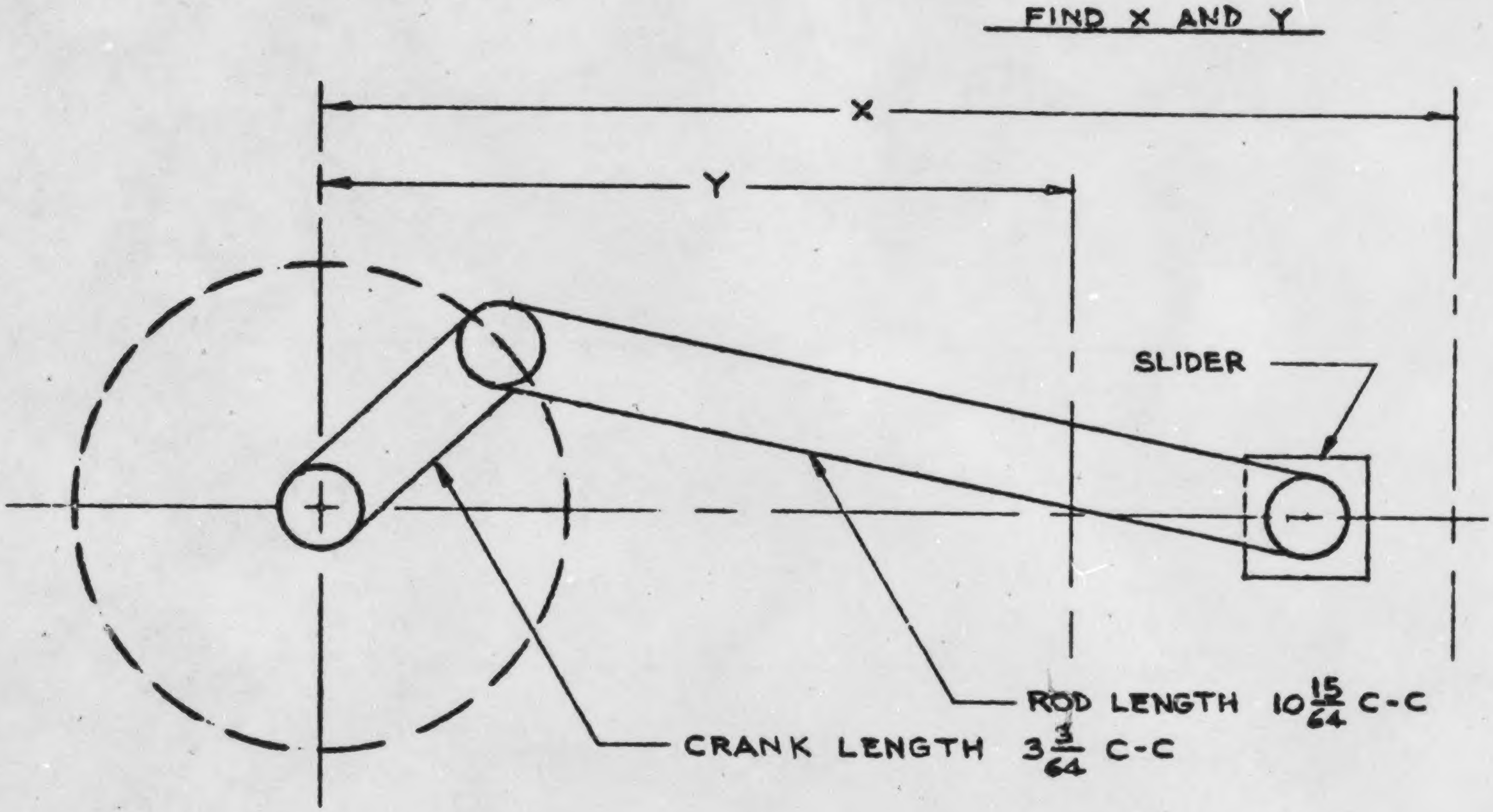
Example 11: If the diameter of the end mill is 1/4 in. and the diameter of the work piece is 5/8 in., how much must the table be moved to center the cutter?

Example 12: Compute the taper turn, using the formula

$$\frac{L}{e} \times \frac{D-d}{2}$$



Appendix
Example 13

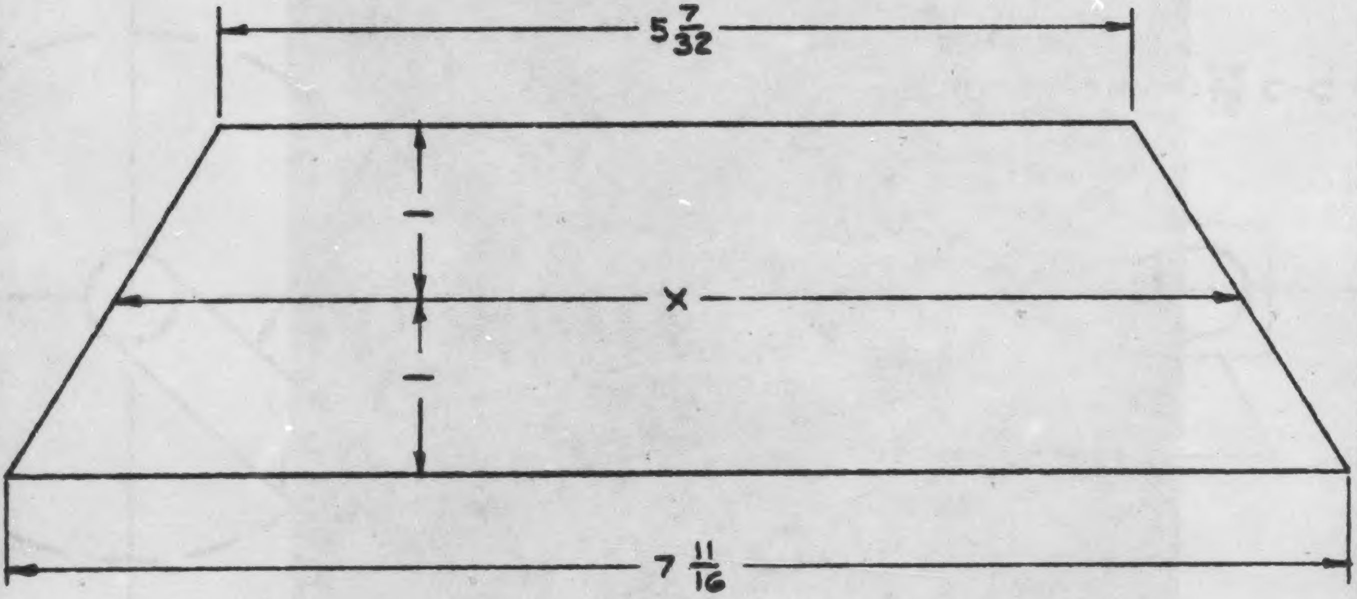

FIND X AND Y
X
Y
SLIDER
ROD LENGTH $10\frac{15}{64}$ C-C
CRANK LENGTH $3\frac{3}{64}$ C-C

SCALE: $\frac{1}{2}$" = 1"

Appendix

Example 14

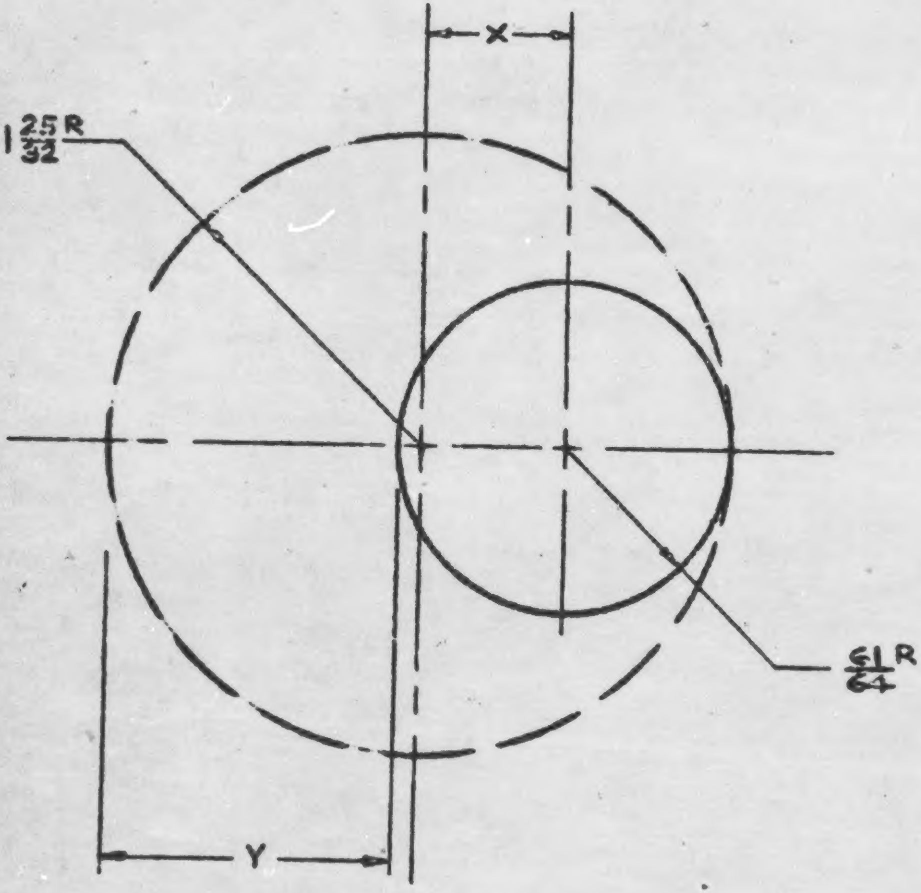
FIND X



SCALE: 1" = 1"

Appendix
Example 15

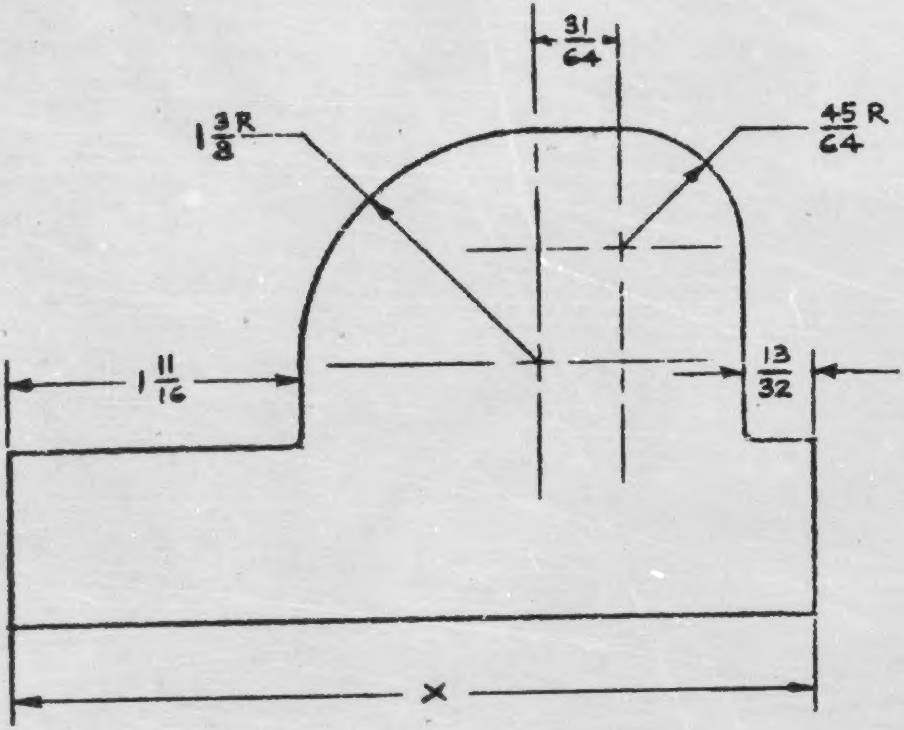
FIND X AND Y



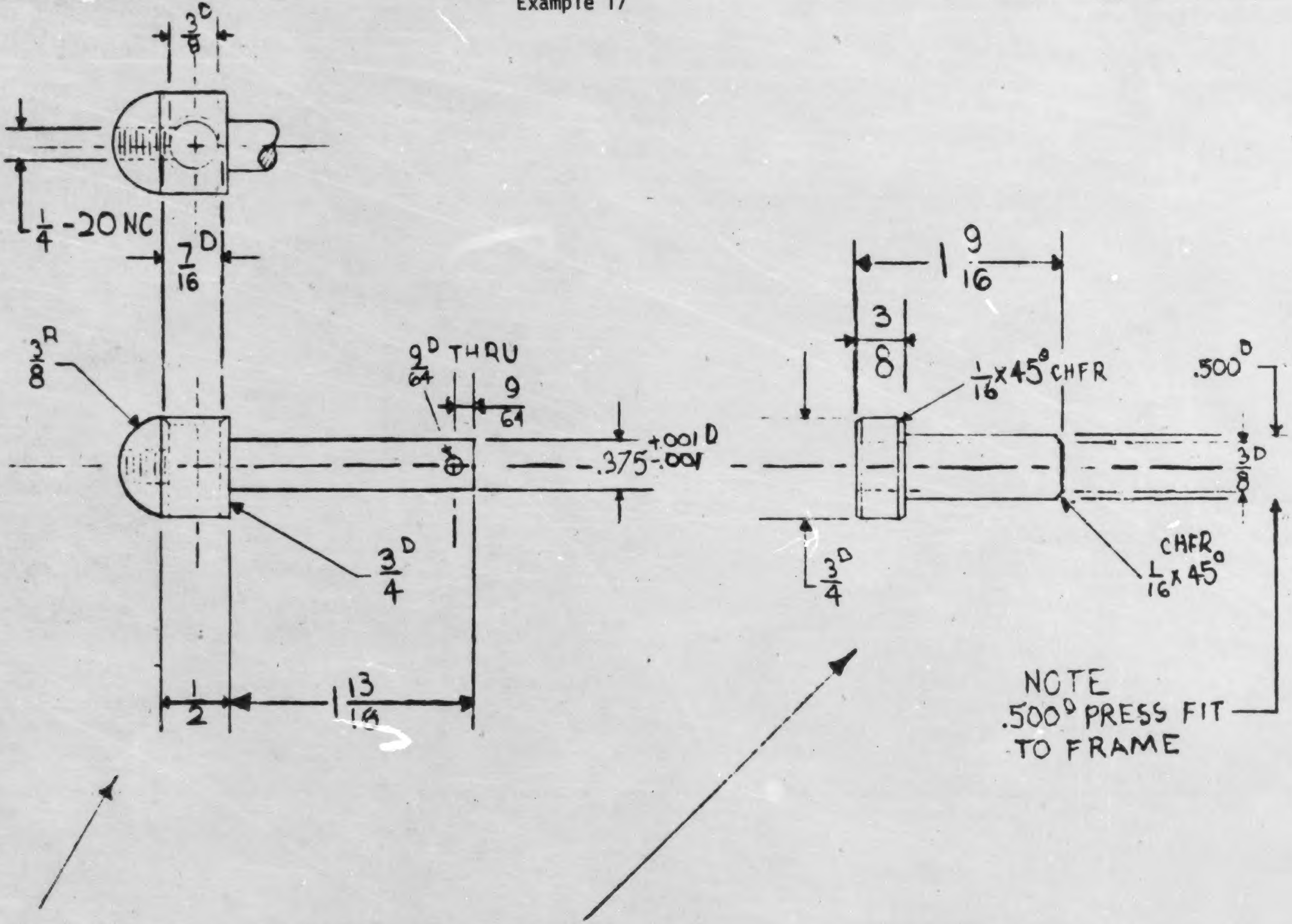
SCALE: 1"=1"

Appendix
Example 16

FIND X



SCALE: 1" = 1"



PEDAL PIN

PEDAL BUSHING

SCALE: FULL

437

438

Cluster Manufacturing

Occupation

Guide Machine Shop III #9704

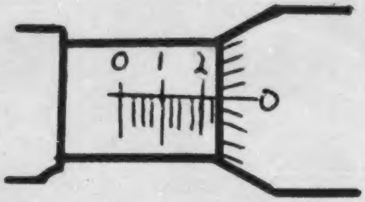
OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

Sht 320 of

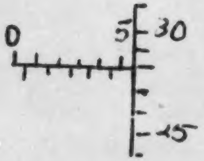
MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement (fractions of inch, decimals, metric)	General Math	Read a micrometer, Vernier caliper, Vernier height gauge, Vernier protractor, gage blocks, Johannson Sine bar, pyrometer. See Appendix Problems 1,2,3,7	Science	
Proportion	General Math	Read and interpret blueprints. See Appendix Problems 8,9,10,11,12	Printing, Home Economics, Science	
Substitution in formula	Algebra	Spur gear calculations, speed and feed calculations. See Appendix Problems 4, 5, 6.	Science	
Trigonometry functions and tables	Trigonometry	Sine bar and gage block calculations. See Appendix Problem 7	Science	

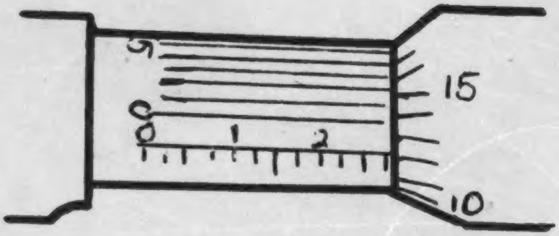
Appendix



Example 1: Read tne micrometer reading.



Example 2: What is the metric micrometer reading ?



Example 3: What is the Vernier reading?

Appendix

Example 4: Select the proper formula to find the outside diameter of a spur gear.

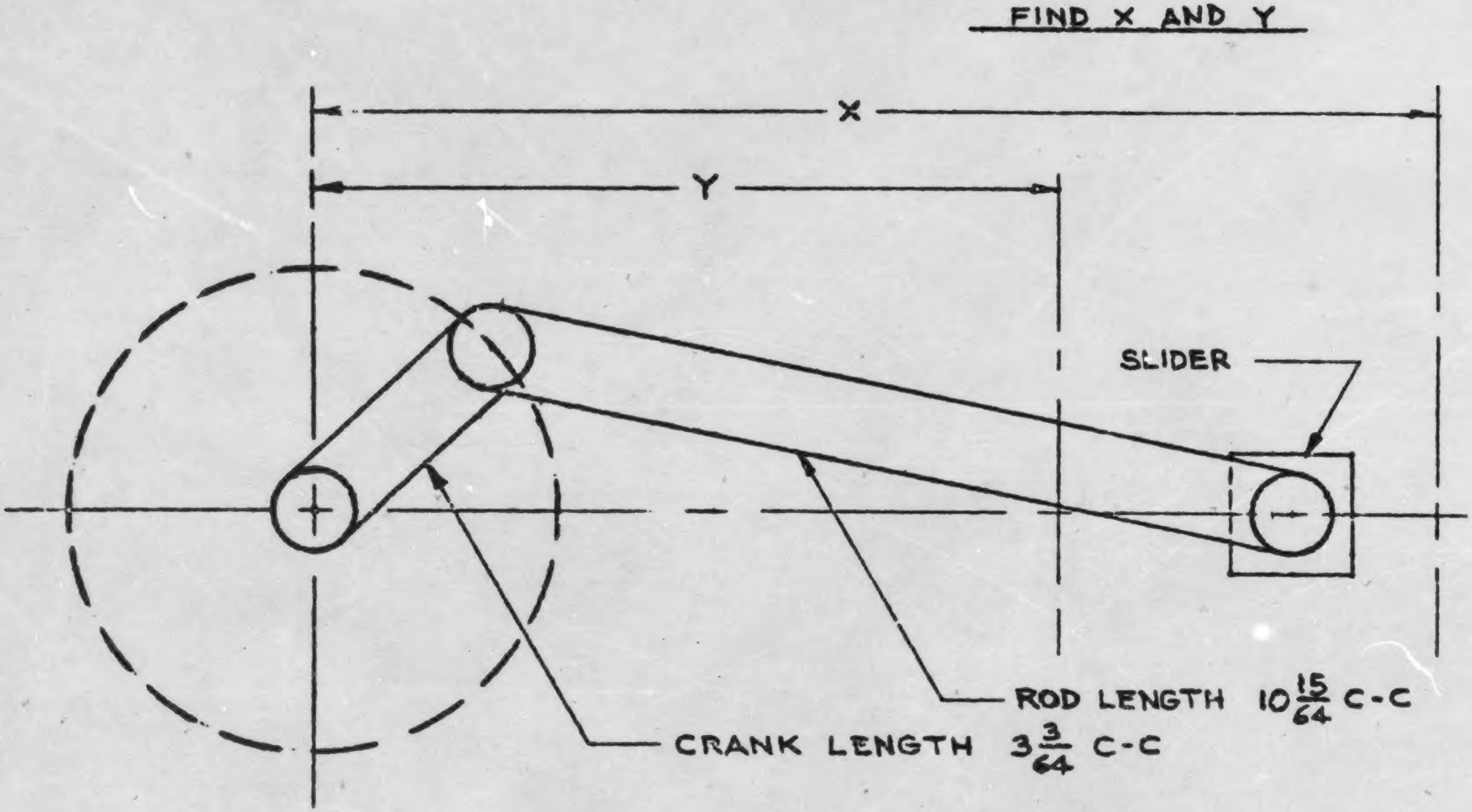
A. $\frac{N}{P}$ B. $\frac{N + 2}{P}$ C. $p^{d}p$ D. $\frac{1.5708}{p}$

Example 5: Figure the R.P.M. of a 6" drill, drilling at the rate of 25 feet per minute.

Example 6: You are shop foreman. Find the R.P.M. and feed rate. [Surface - 46m/min, diameter of cutter - 76.15 mm, chip load - .05 mm, 4 teeth]

Example 7: What total combination of gauge blocks is needed to tilt a five-inch sine bar $19^{o}5'$?

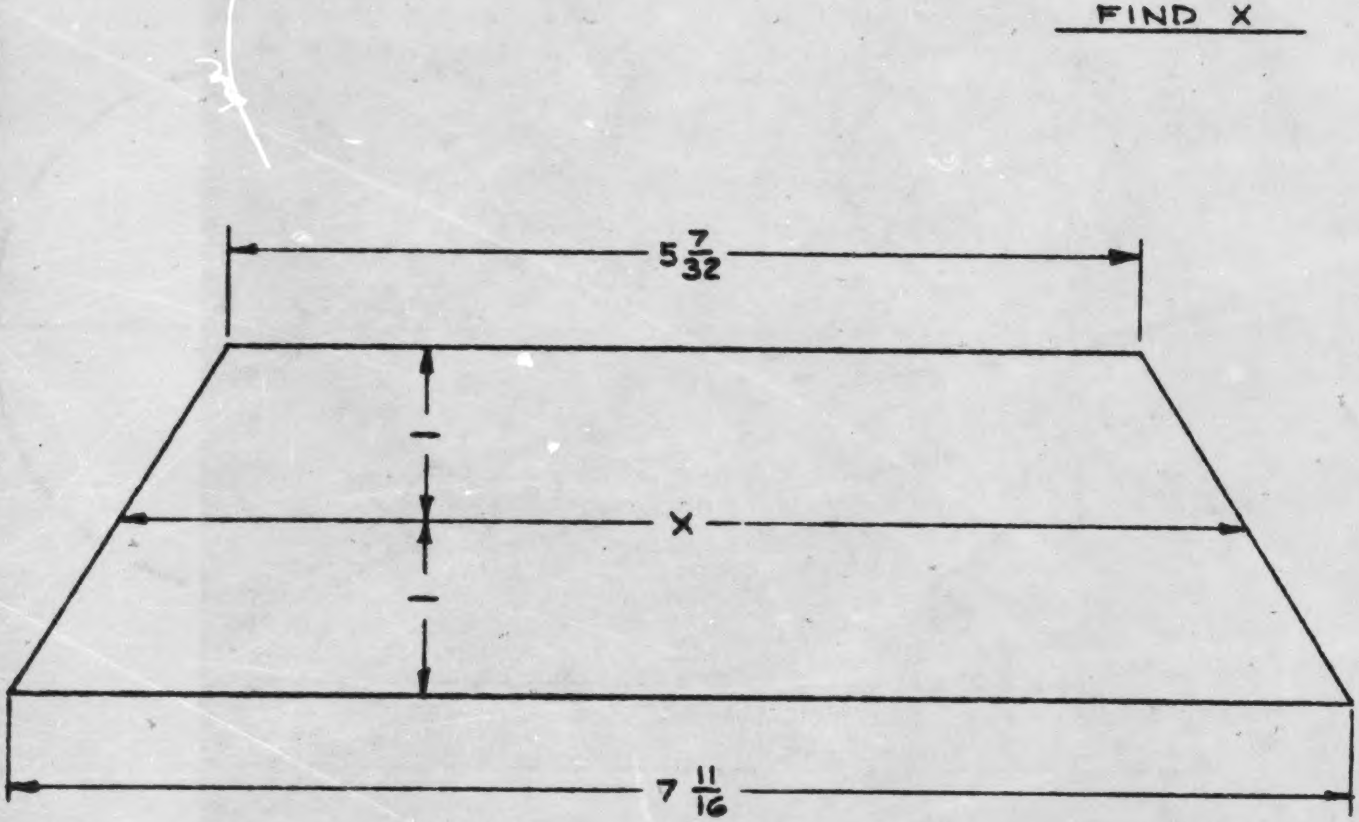
Appendix
Example 8


FIND X AND Y
X
Y
SLIDER
ROD LENGTH $10\frac{15}{64}$ C-C
CRANK LENGTH $3\frac{3}{64}$ C-C

SCALE: $\frac{1}{2}$" = 1"

Appendix

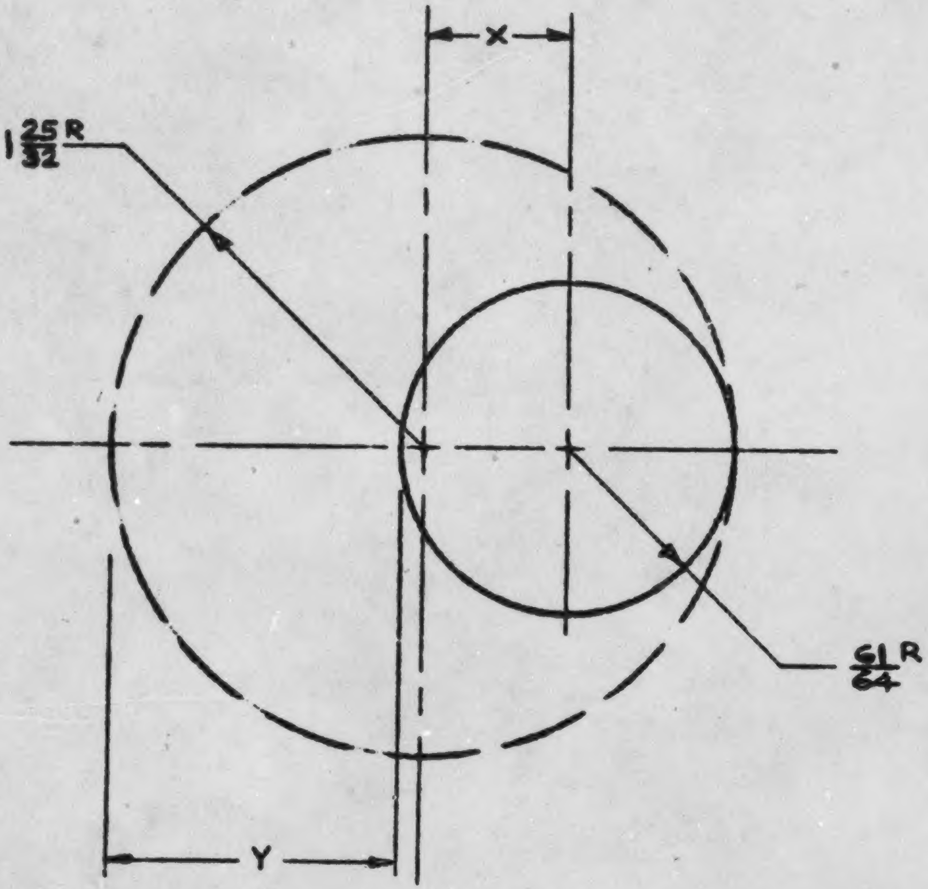
Example 9



SCALE: 1" = 1"

Appendix
Example 10

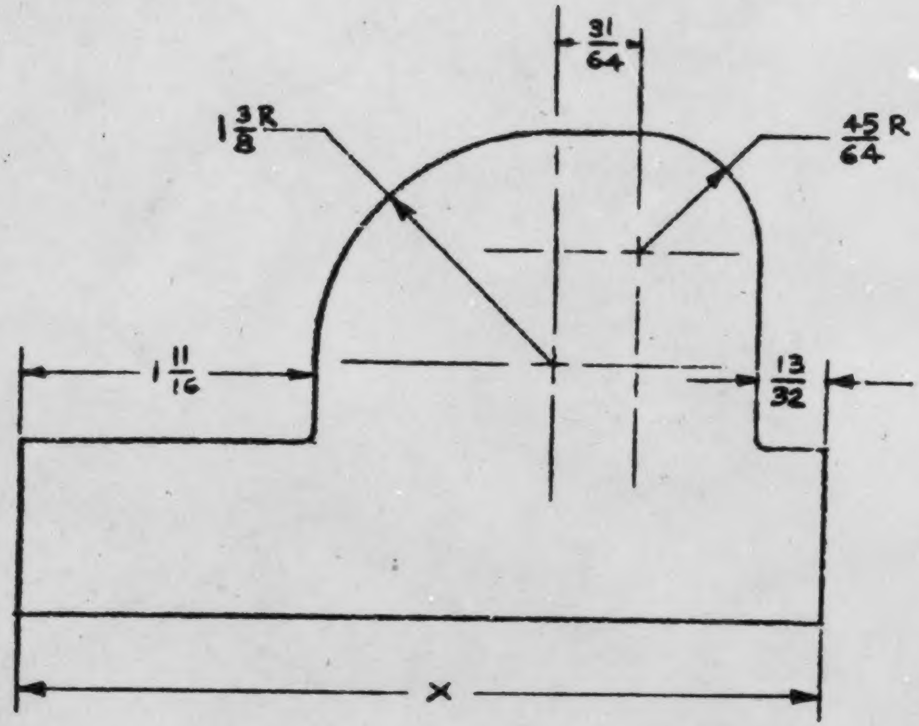
FIND X AND Y



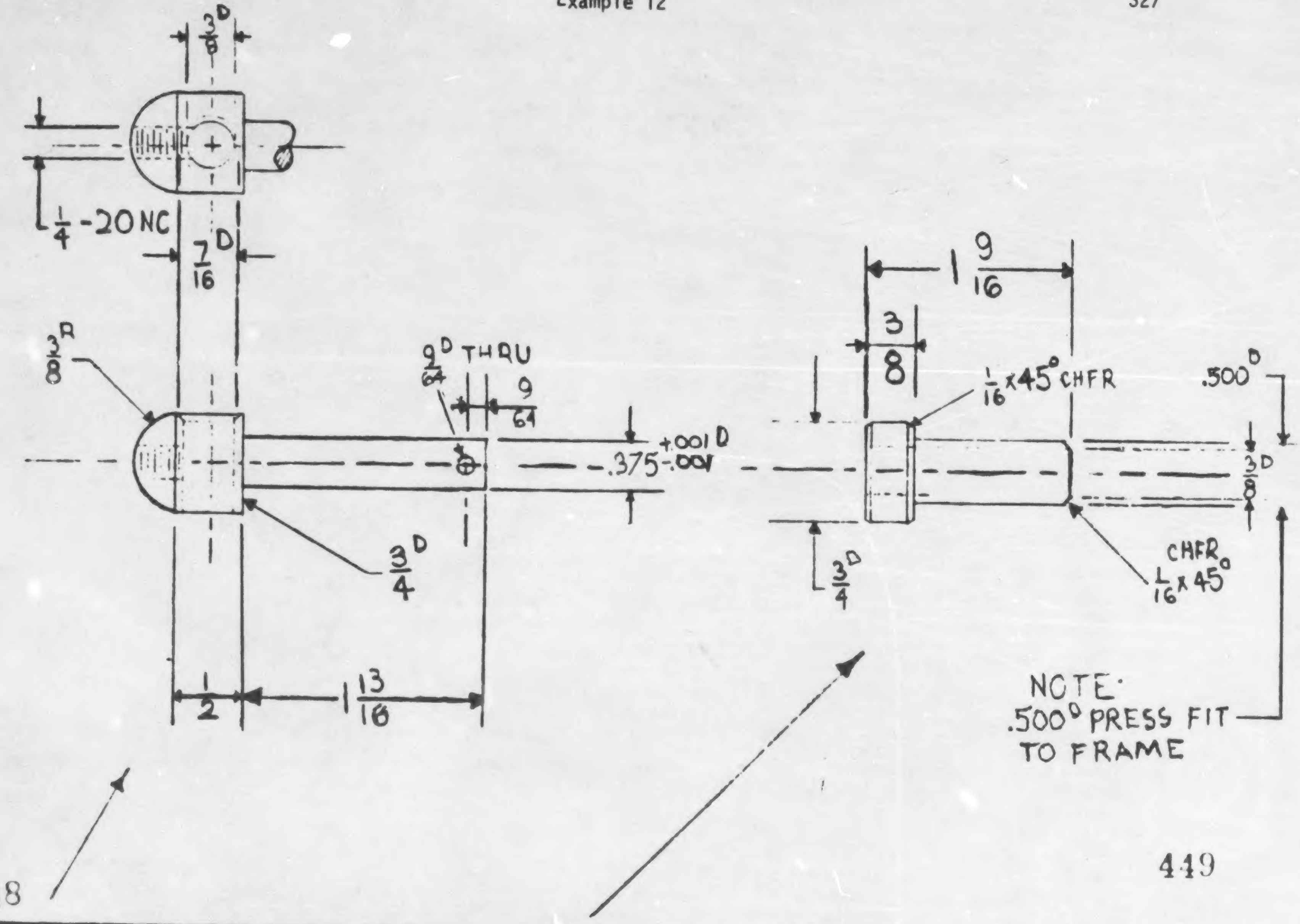
SCALE: 1"=1"

Appendix
Example 11

FIND X



SCALE: 1" = 1"



PEDAL PIN PEDAL BUSHING

SCALE FULL

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OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

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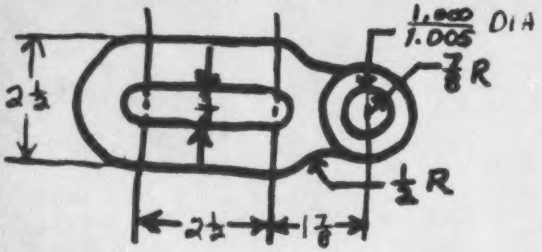
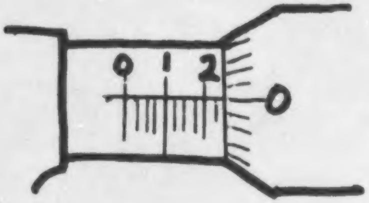
MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Read measures to 1/64 inch tolerance; metric measure	General Math, Intuitive Geometry	Use measuring instruments (gages, calipers, vernier tools, micrometers 1/1000 inch) See Appendix Problems 2, 3	Science	
Conversion between English and Metric	General Math	Dual dimensioning See Appendix Problem 1	Science	
Use operations with fractions and decimals, conversions	General Math	Convert measures, read blueprints, taper, speed and feed, R.P.M., table travel See Appendix Problems 4, 5, 7, 8, 9, 10		
Recognize geometric figures (circle, radius diameter, square, rectangle, arc, circumference, degrees, angles, etc.)	Intuitive Geometry	Make patterns, See Appendix Problems 6, 11, 12, 13, recognize parts, see Appendix problems 14, 15	Physics	
Use Formulae	Intuitive Geometry Geometry, Algebra	Finding taper, figuring R.P.M., see Appendix problems 7, 9, 10. Figuring speed and feed, table travel.	Sciences	
Scale drawing proportion	Algebra	Do pattern making and reading. See Appendix problems 11, 12, 13, 14, 15		



Example 1: Redimension this piece in metric.

Example 2: What is the micrometer reading?



Example 3: Measure to the nearest 1/64", to the nearest mm; in decimal part of an inch.

A.______ B.______ C.____ D.______

Example 4: Change 5/8 of an inch to a decimal. Check it on the table.

Example 5: What is 1/2 of 1/16?

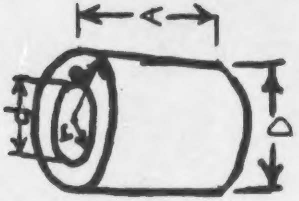
Example 6: Write 16 degrees 8 minutes and 20 seconds.

Example 7: Use the formula

$V = Tl\ A\ (R^2 - r^2)$

to find the volume

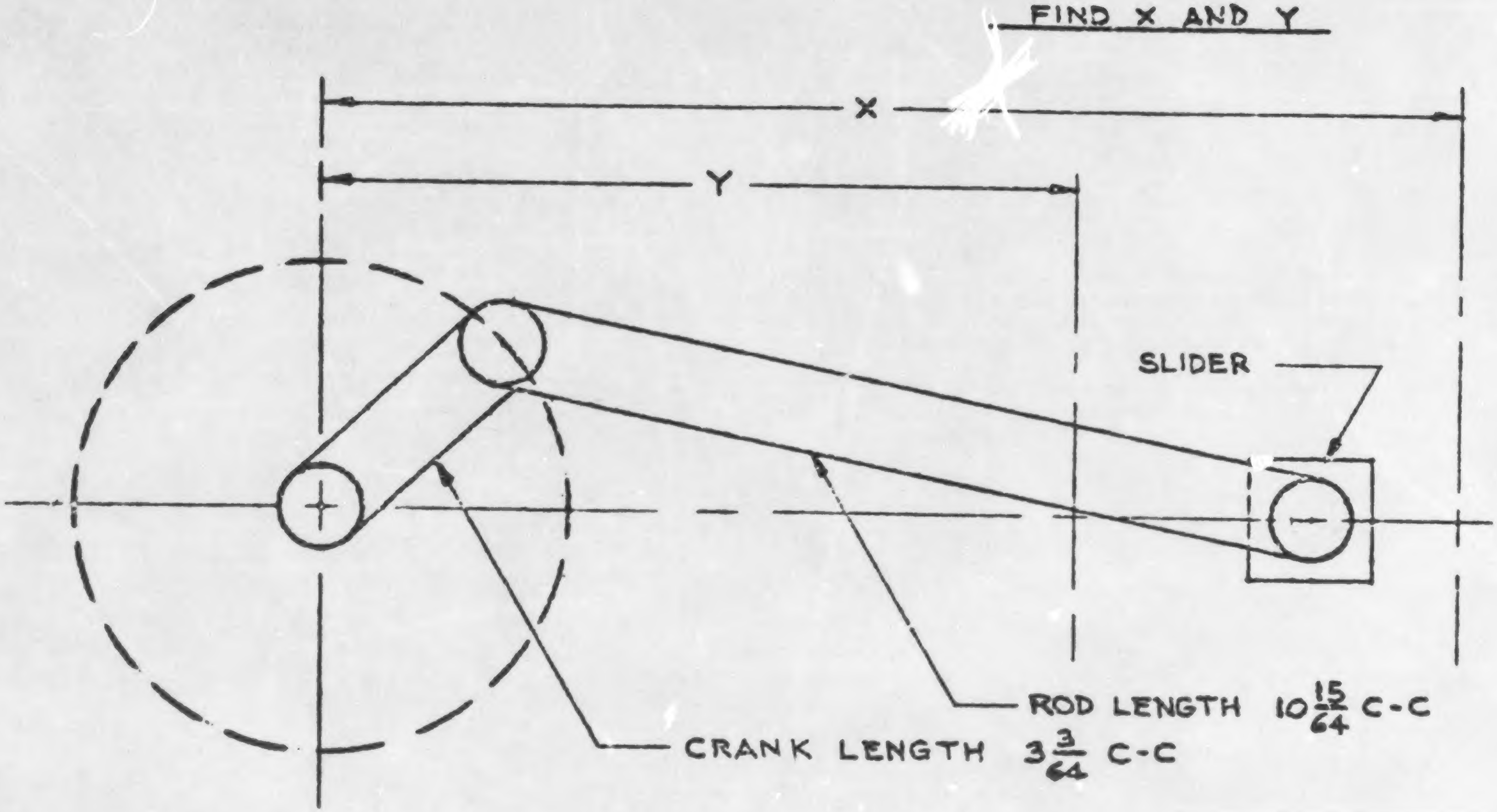
if $R = 9$, $r = 6$, $A = 12$



Example 8: A dimension is $.630\,^{+.002}_{-.003}$. Find the largest and smallest dimensions.

Example 9: Figure the R.P.M. of a 4" drill, drilling at the rate of 35 feet per minute.

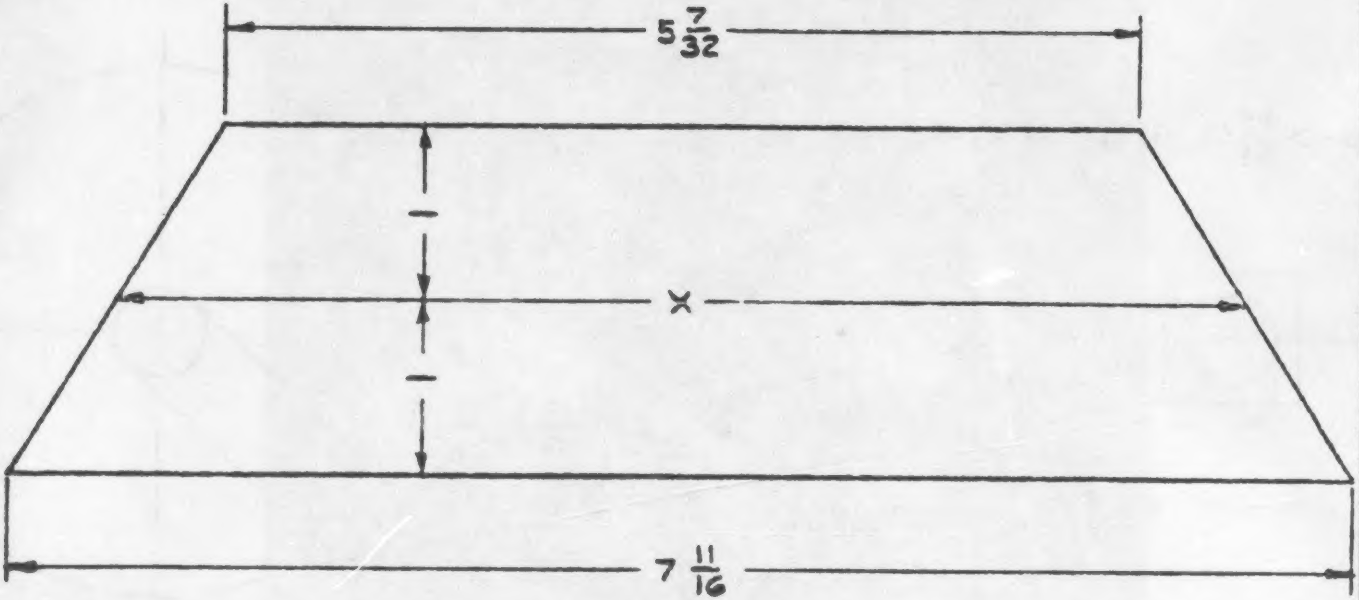
Example 10: Figure the cutting speed of a 9: diameter milling cutter at 120 r.p.m.


FIND X AND Y
X
Y
SLIDER
ROD LENGTH $10\frac{15}{64}$ C-C
CRANK LENGTH $3\frac{3}{64}$ C-C

SCALE: $\frac{1}{2}$" = 1"

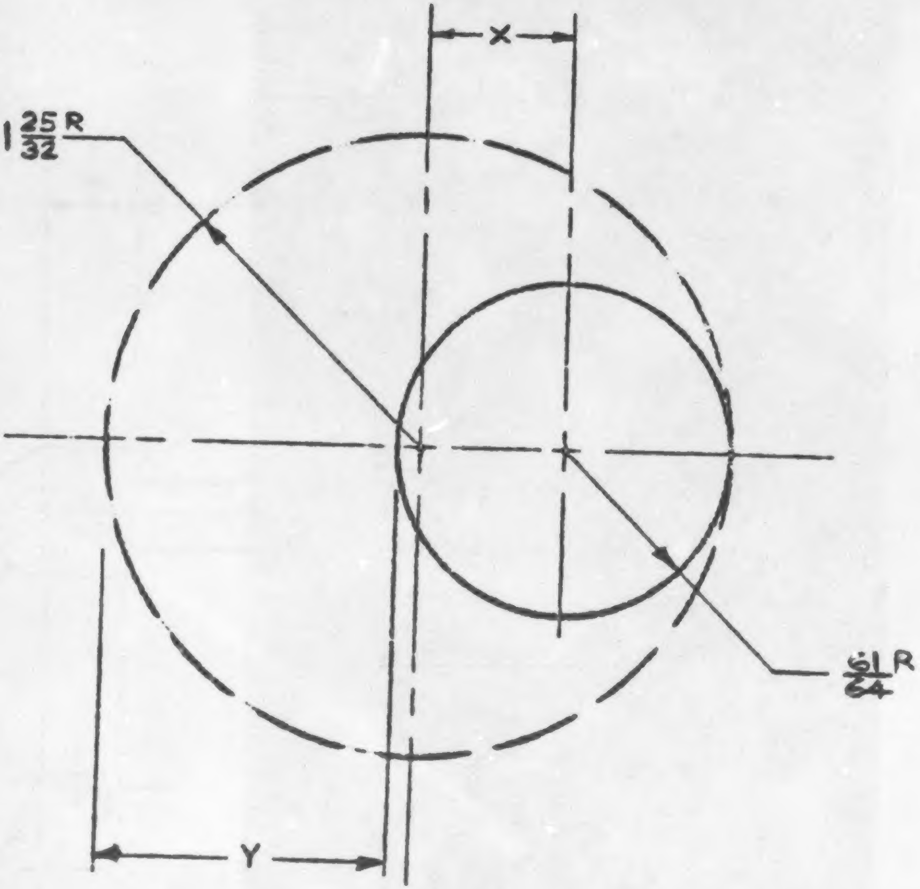
Appendix

FIND X

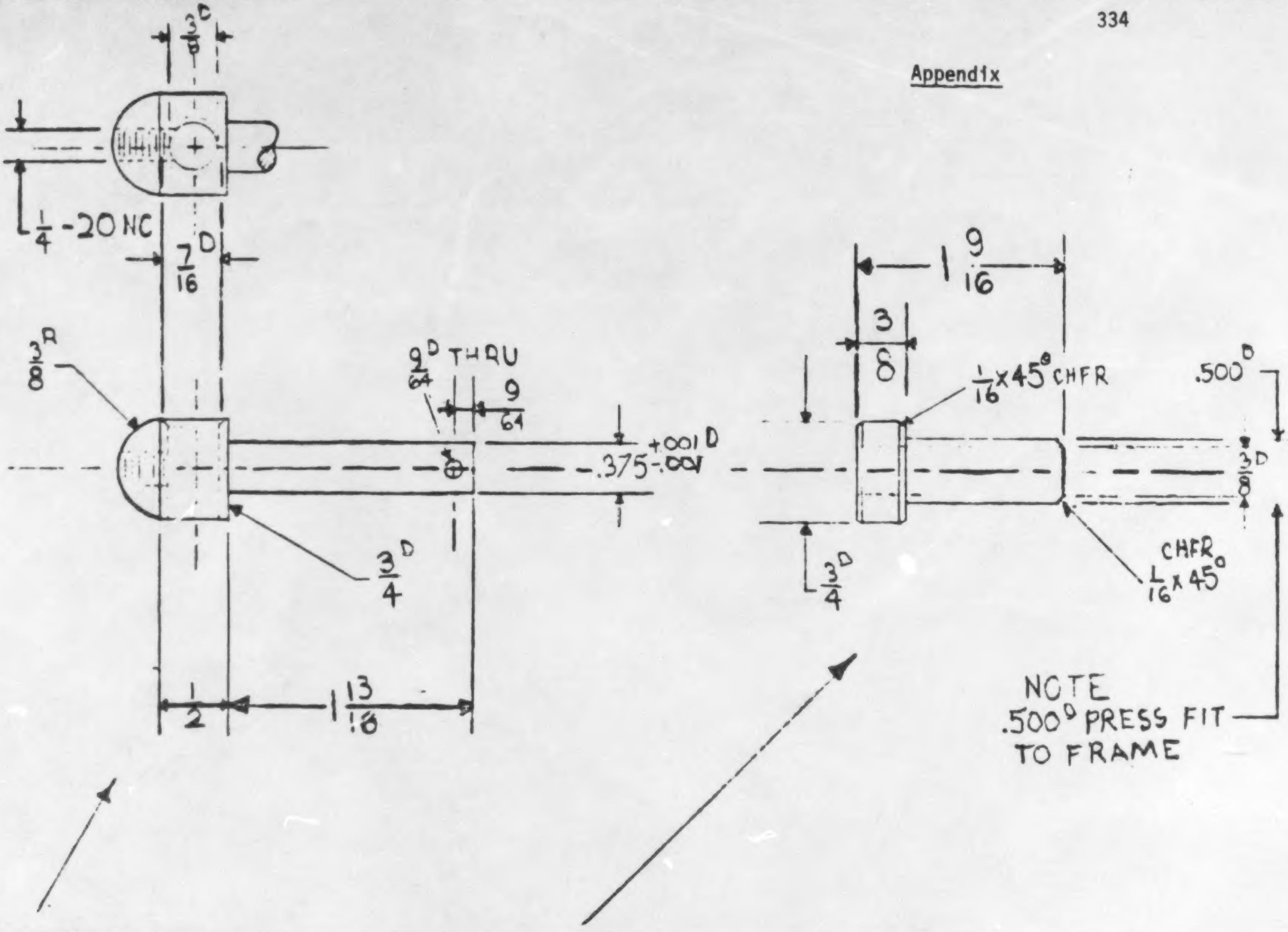


SCALE: 1" = 1"

FIND X AND Y



SCALE: 1"=1"

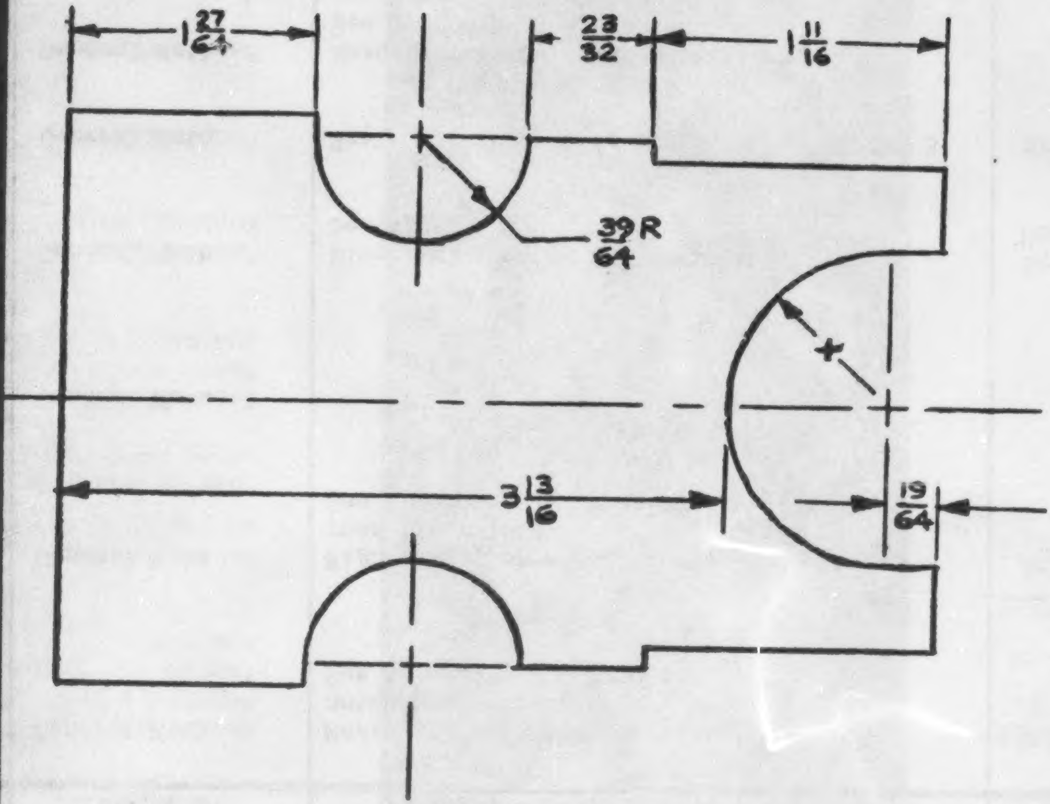


NOTE
.500 D PRESS FIT
TO FRAME

PEDAL PIN	PEDAL BUSHING	SCALE: FULL

Appendix

FIND X



SCALE: 1" = 1"

Cluster Manufacturing

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OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

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MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement with Vernier scale (decimals, read and add)	General Math	Measuring with Vernier tools (the books noted are very helpful). See Appendix Problems 1, 2	Science	Shopmathematics, Felker pp 89-97
Whole numbers, decimals, fractions	General Math	Figure mill speed and feed, find tapers, read blueprints. See Appendix Problems 3, 4, 5	Science	Exploring Power Mechanics Glenn pp 219-222
Use of substitution in formula	Algebra			
Conversion Metric-English and English-Metric	General Math			
Linear measure English, metric	General Math	Blueprint reading and sketching. See Appendix Problem 5	Science, Home Economics	
Proportion	General Math	Scale drawings. See Appendix Prob. 5	Home Economics	
Read a scale	General Math	Read pyrometer, hardness testers. See Appendix Problem 6		
Graphing, making a circle of given diameter or radius	Geometry, Intuitive Geometry	Helpful in enlarging a layout for a pattern See Appendix Problem 7		

(Also see 9698 for pre-requisite skills attached)

Example 1: Fill in the table for a ten-thousandths micrometer.

Barrel Graduations Showing	Thimble Reading	Vernier line Coinciding with thimble graduation	Complete Reading
0	24	8	
10	10	5	
13	11	3	
9	19	0	

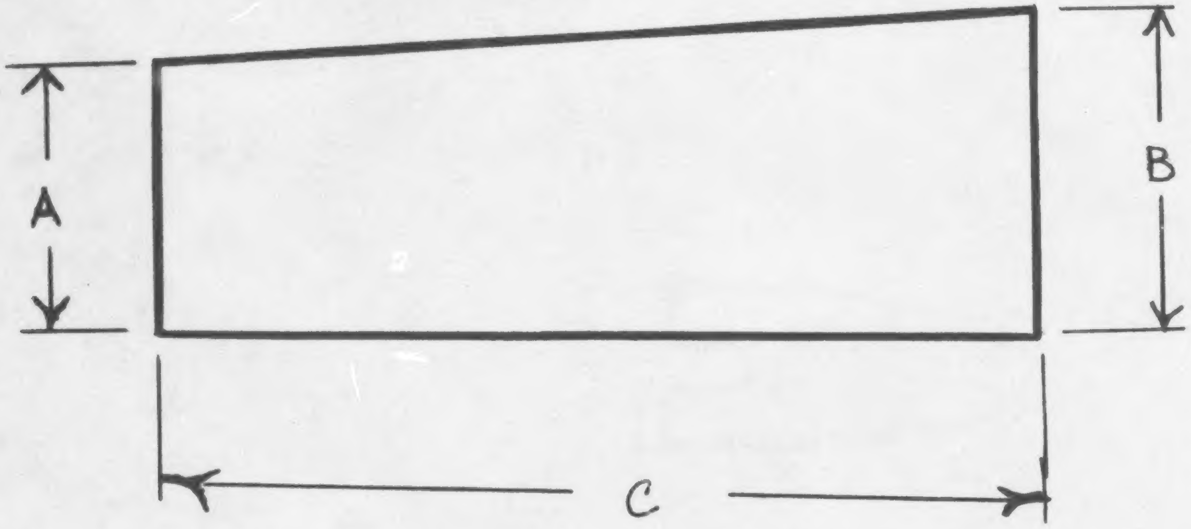
Example 2: Fill in the table for the vernier readings.

Position of Zero on Vernier	Coinciding Vernier line	Vernier Reading
1 inch and 30 grad	25	
3 inches and 0 grad	13	
0 inches and 27 grad	7	
2 inches and 9 grad	6	

Example 3: Convert 5.5 inches per minute to centimeters per minute.

Example 4: You are shop foreman. Complete the speed and feed chart below.

Job No.	Surface	Dia. of Cutter	Type of Material	Chip Load	No. of Teeth	RPM	Feed Rate
1	$150 \frac{ft}{min}$	.500"	h. c. steel	.002	4		
2	$25 \frac{ft}{min}$	4"	cast steel	.003	8		
3	$1000 \frac{ft}{min}$	5"	aluminum	.001	40		
4	$46 \frac{m}{min}$	76.15 mm	I.C. Steel	.05 mm	4		
5	$300 \frac{m}{min}$	150.10 mm	brass	.02 mm	42		
6	$100 \frac{m}{min}$	25.4 mm	l.c. steel	.05 mm	3		



Example 5: Measure and find the taper

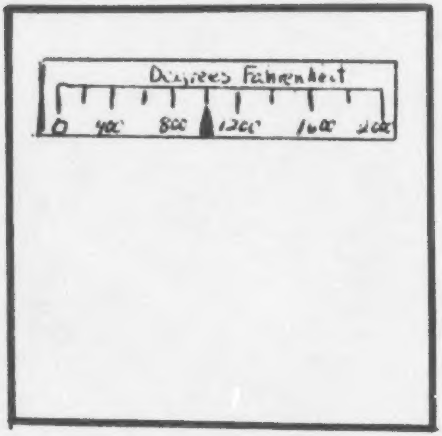
Scale ½" = 1"

A = ________ Taper = ______

B = ________

C = ________

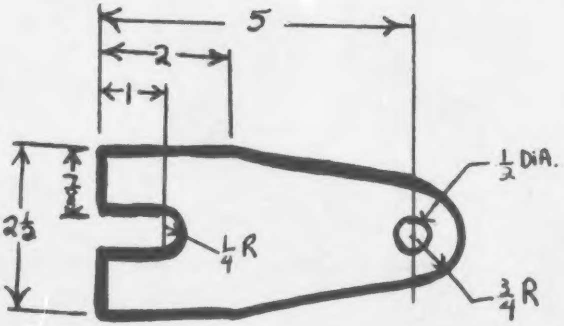
Example 6:



What is the pyrometer reading?

_______ °F

Example 7: Copy the layout using measures given in inches.



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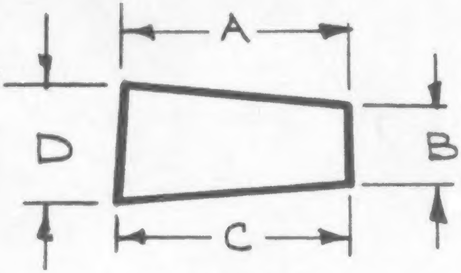
MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Use operations with whole numbers, fractions, decimals	Basic Math	Calculate speed and feed. Fixed gages and tolerance. See Appendix Problems 1, 2, 3, 4, 5, 6, 7, 8, 9	Science	
Use metric measurement and compare to English	Basic Math	Measure stock in metric, convert patterns, speed and feed to metric. See Appendix Problems 2, 3, 5, 6, 8	Science Social Studies	
Substitution in formulas	Algebra I	Make speed and feed calculations, compute tapers, and amount to offset tailstock. See Appendix Problems 4, 5, 7, 8, 9		
Read tables	Basic Math	Read, speed and feed tables, trig. tables See Appendix Problem 9	Social Studies, Languages, Sciences	
Angles and trigonometry functions	Trigonometry	Enrichment - compute taper in metric system - See Appendix Problem 9	Physics	

Example 1: The diameter of a hole is 1.370 ± .0005. What does this mean?

Example 2: Convert 2½ ft. to meters; 0.75 inches to centimeters; and ¼ inch to millimeters.

Example 3: Measure the peg in mm.

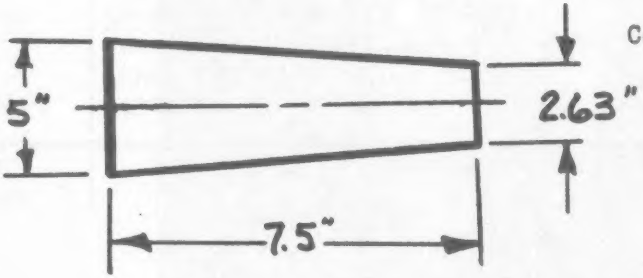


Example 4: A cutter 5 inches in diameter with 32 teeth cuts a ¼ inch deep slot. What is the rpm and feed rate?

Example 5: Calculate the rpm and feed rates in cm/min:
Surface meters/min - 45; cutter teeth - 4; diameter of cutter - 76.20 mm; chip load - .05 mm.

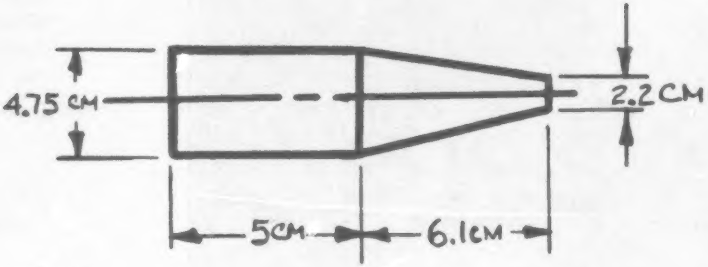
Example 6: Convert 6.8 inches per minute into its metric equivalent.

Example 7:



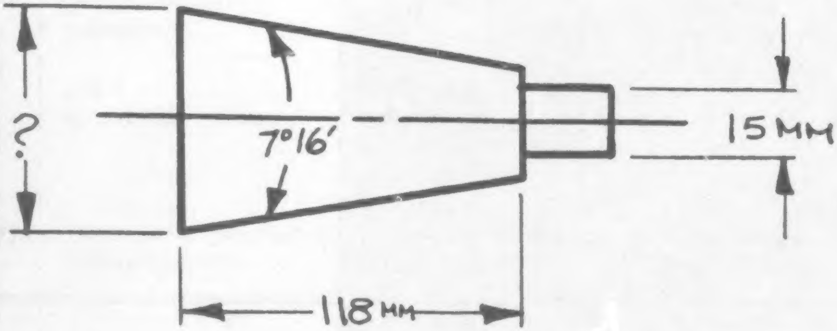
Compute the taper.

Example 8: Compute the tailstock offset:



Example 9:

Find the larger diameter



Cluster Manufacturing

Occupation

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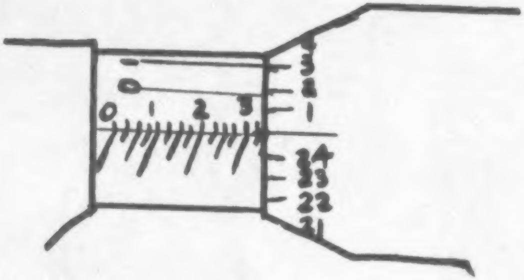
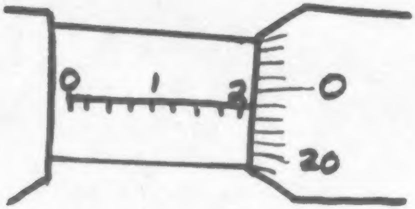
MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement (inches, decimal inches, metric, angles)	General Math Intuitive Geometry	Read blueprints, do layout work, make radial line development. See Appendix Problems 1, 2, 3, 4, 7, 8, 9, 10, 12.	Science	
Proportion	Algebra, General Math	Read blueprints, scale drawings, See Appendix Problems 4, 6, 7.	Science, Art	
Visualize a three-dimensional figure from a two-dimensional sketch.	Geometry, Solid Geometry	Sectional view interpretation of blueprints. See Appendix Problems 8, 9.	Art	
Constructions with circle; areas of plane and solid figures	Geometry, solid geometry	Layout work, (circumference, arc, parallel lines, bisect on angle, recognize diameter and radius, find center of circle from arc dividing an arc into equal parts), figuring material used. See Appendix Problems 4, 5, 7, 8, 9.	Art	
Substitute in a formula	Algebra	Parallel line development of pattern; figure material used. See Appendix Problems 5, 9.	Science	
Use fractions, decimals, whole numbers, read conversion chart-decimal-fractions	General Math	Measure patterns, draw layouts, select decimal or fractions to use in measureements. See Appendix Problems 5, 7, 8, 9, 11.	Science, Economics	

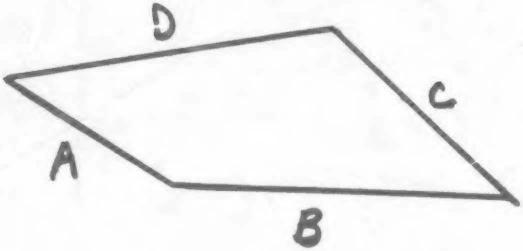


Example 1: What is the micrometer reading?



Example 2: What is the micrometer reading?

Example 3: Measure the figure to 1/32" and nearest mm.



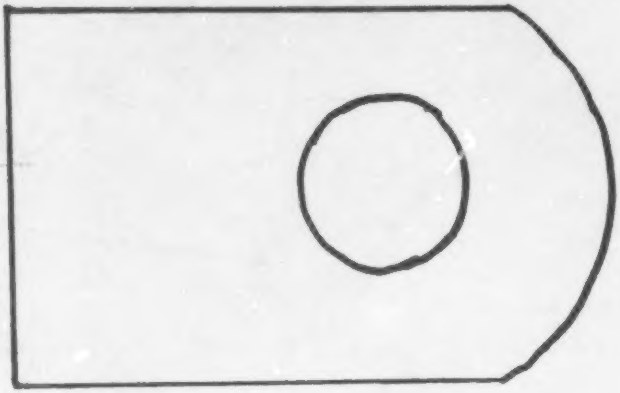
A ________

B ________

C ________

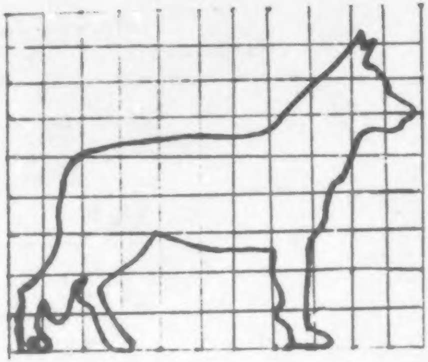
D ________

Example 4: Copy the figure on a scale ½ : 1. Label the measurers.



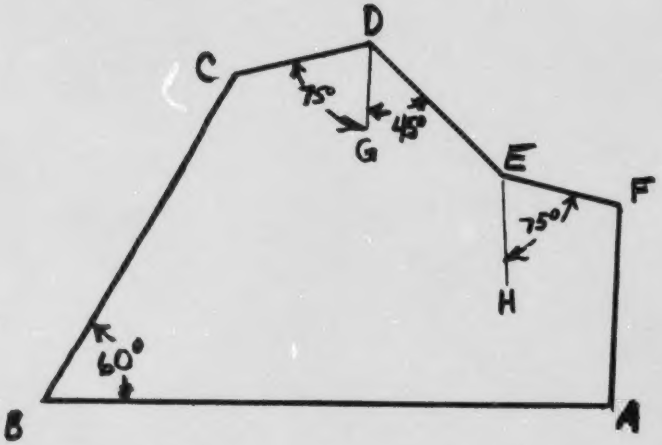
Example 5: Calculate the amount of metal needed to make ④ in square inches.

Example 6:



Enlarge the pattern using the scale isg : 1 in.

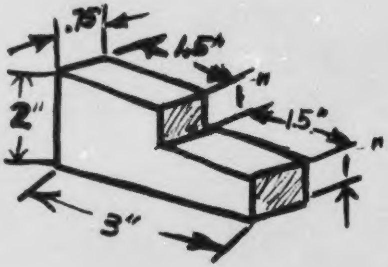
Example 7.



AB = 172 cm
BC = 113 cm
CD = 54 cm
EF = 37 cm
DE = 29 cm
DG = 10 cm
EH = 15 cm

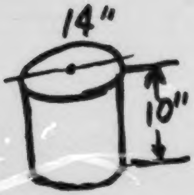
Copy the figure using the scale
1mm : 1 cm

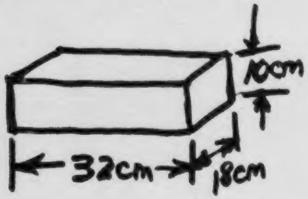
Example 8: Draw two views for the figure.



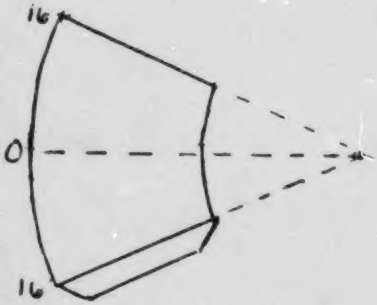
Example 9:

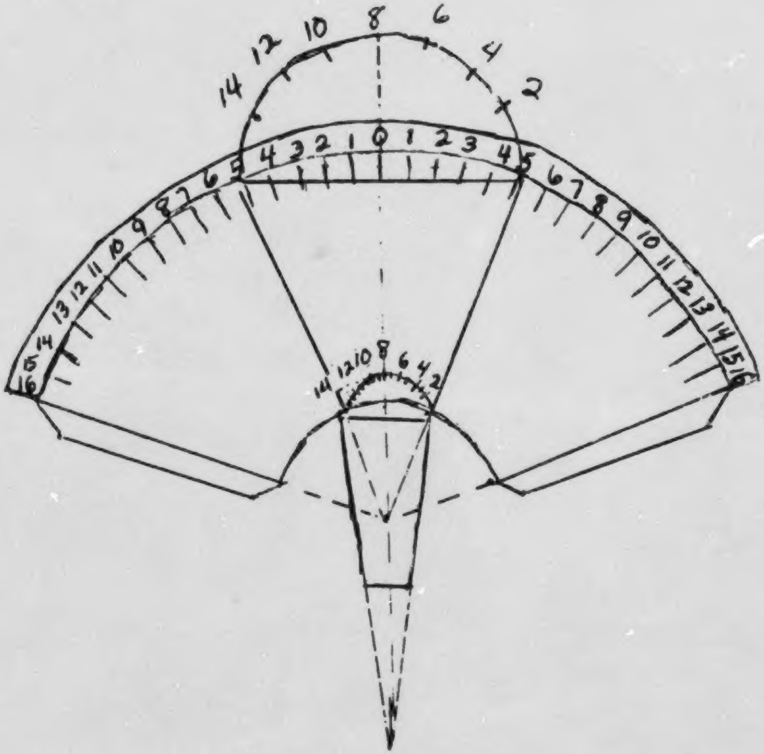
Make a stretchout sketch of the cylinder and the pan.





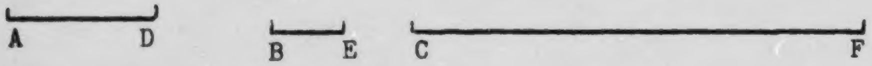
Example 10: What type of layout is illustrated below?





Example 11: The tolerance is stated as 97.50" ± .002.
What does this mean?

Example 12: Measure in 1/4", 1/8", 1/16" and mm.



AD ___ ___ ___ ___

BE ___ ___ ___ ___

CF ___ ___ ___ ___

Cluster Manufacturing

Occupation

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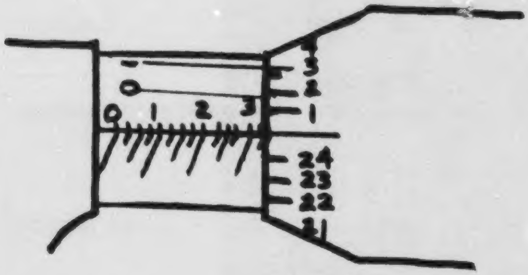
MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Read measurement tools (English/metric)	Intuitive Geometry General Math	Read a micrometer, ruler, protractor, do parallel and radial pattern development, read regulator. See Appendix Problems 1, 2, 3, 4, 7, 8, 9, 12.	Science, Art	
Constructions	Geometry	Layout (measure angles, bisect angle, line, circle constructions, construct 90° angle, bisect arc). See Appendix Problems 4, 7, 8, 9.	Art	
Areas of plane and solid figure	Geometry, Algebra, solid geometry	Calculate materials needed for patterns of the trapezoid, square, rectangle, ellipse, circle, cube, sq. prism, regular pyramid, frustum of cone and pyramid, right cone, right cylinder, slant height, radius, altitude). See Appendix Problems 5, 9	Art	
Visualizing solid figures from plain layouts	Geometry, Intuitive Geometry	Visualize finished product from layout and vice versa. See Appendix Problems 8, 9.	Art	
Construct parallel lines	Geometry	Make parallel line development of pattern and radial line development. See Appendix Problems 9, 10.	Art	
Proportions	Geometry, Algebra	Interpret and draw patterns. See Appendix Problems 4, 6, 7.	Science, Art	
Graphing	Algebra	Enlarge or reduce patterns on a grid. See Appendix Problem 6.	Art, Economics	



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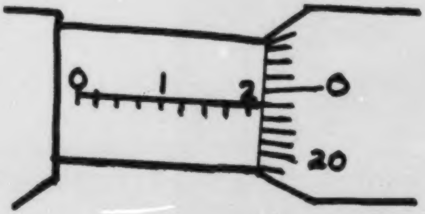

Example 2: What is the micrometer reading?

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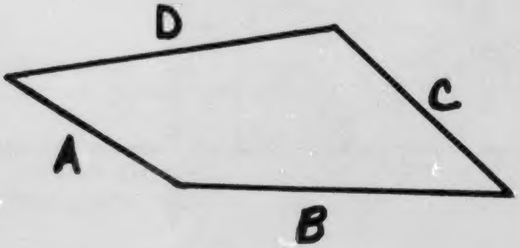
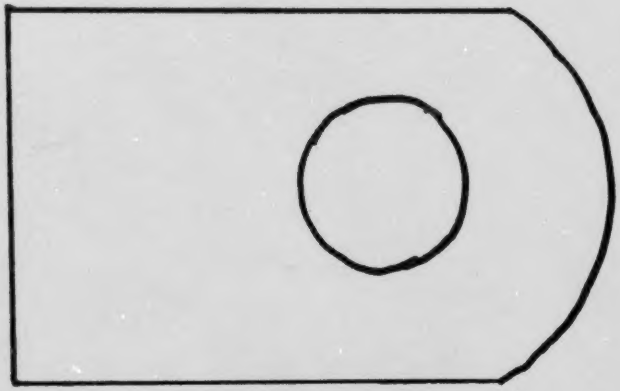


A ________
B ________
C ________
D ________

Example 4: Copy the figure on a scale ½ : 1. Label the measurers.



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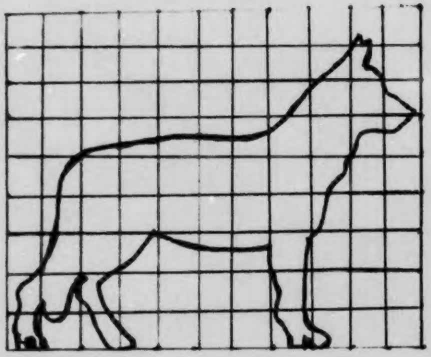
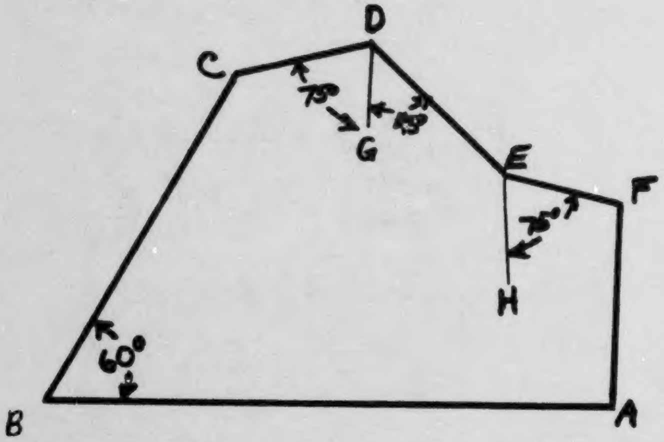


Enlarge the pattern using the scale isg : 1 in.

Example 7.



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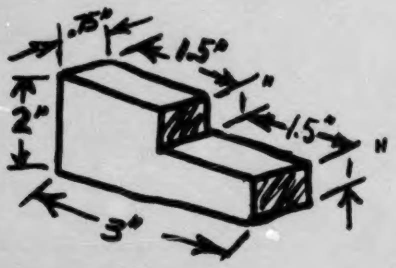

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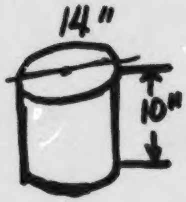

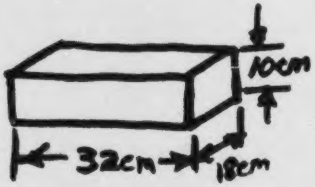

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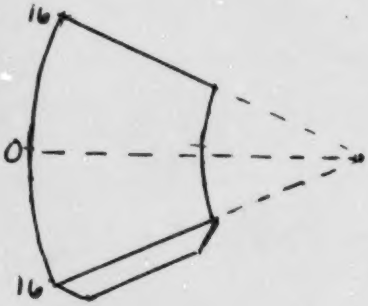

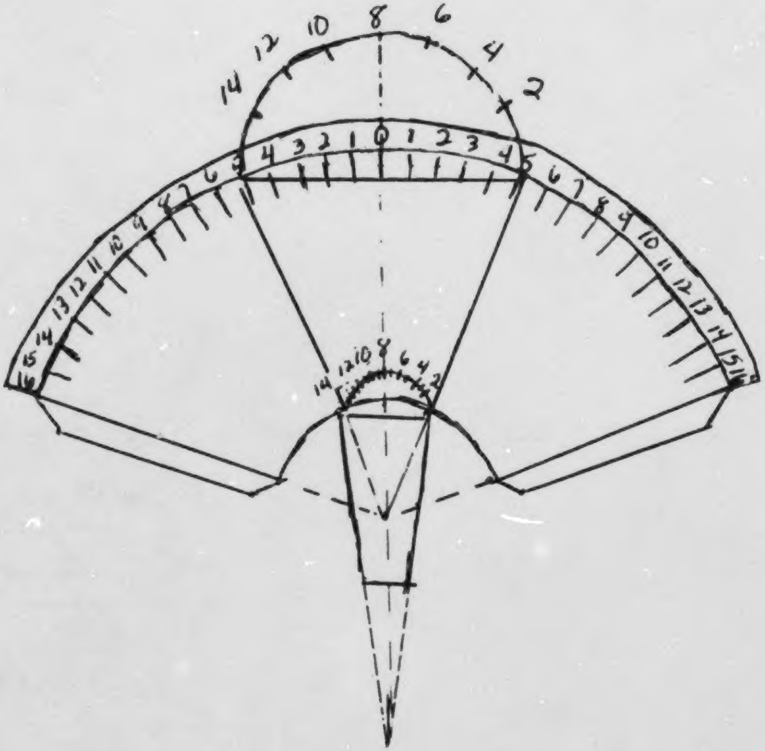

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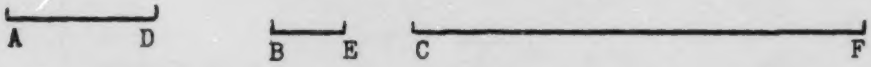

AD ____ ____ ____ ____

BE ____ ____ ____ ____

CF ____ ____ ____ ____

Cluster Manufacturing

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MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Read measurement tools (English/Metric)	Intuitive geometry, General Math	Read a micrometer, ruler, protractor, parallel and radial pattern development, read regulator. See Appendix Problems 1, 2, 3, 4, 7, 8, 9, 12.	Science, Art	
Constructions	Geometry	Layout (measure angles, bisect angle, line, circle constructions, construct 90° angle, bisect arc). See Appendix Problems 4 7, 8, 9, 10, 13.	Art	
Areas of plane end and solid figures	Geometry, Algebra Solid geometry	(trapezoid, square, rectangle, ellipse, circle, cube, sq. prism, regular pyramid, frustum of cone and pyramid, right cone, right cylinder, slant height, radius, altitude) - pattern, calculate materials. See Appendix Problems 5, 9, 13.	Art, Science	
Use decimals, fractions, whole numbers	General Math	Calculating above values, tolerances. See Appendix Problems 5, 7, 8, 9, 11.	Science, Economics	
Visualizing solid figures from plain layouts	Geometry, Intuitive Geometry	Visualize finished product from layout and vice versa. See Appendix Problems 8, 9, 10, 13.	Art	
Construct parallel lines	Geometry	Develop parallel line and radial line patterns; see Appendix Problems 9, 10.	Art	
Proportions	Geometry, Algebra	Interpret and draw patterns. See Appendix Problems 4, 6, 7.	Science, Art	

Cluster Manufacturing

Occupation

Guide Sheet Metal III #9709

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

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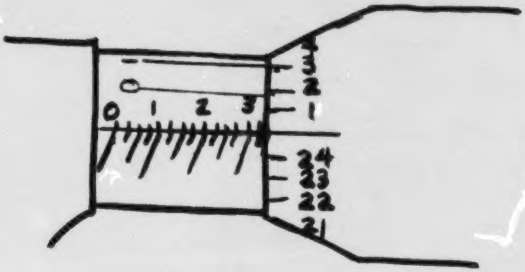
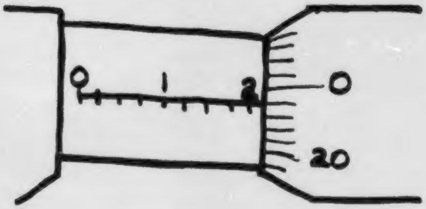
MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Graphing	Algebra	Enlarge or reduce patterns on a grid. See Appendix Problem 6	Art, Economics	
Solid figures (uses parts of cones, prisms, triangles)	Solid geometry	Make a pattern using the triangulation method (for projects like a transition piece to connect a square duct to a round pipe) See Appendix Problem 13.		

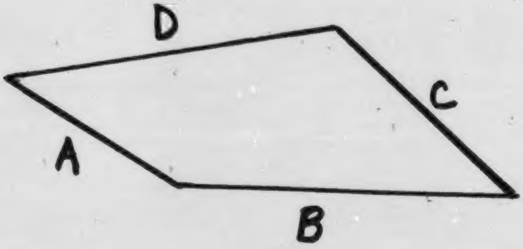


Example 1: What is the micrometer reading?



Example 2: What is the micrometer reading?

Example 3: Measure the figure to 1/32" and nearest mm.



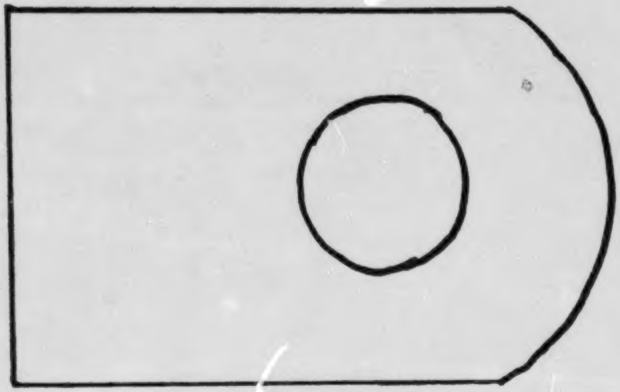
A ____________

B ____________

C ____________

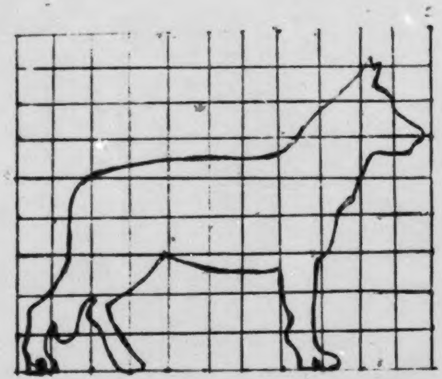
D ____________

Example 4: Copy the figure on a scale $\frac{1}{2}$: 1. Label the measurers.



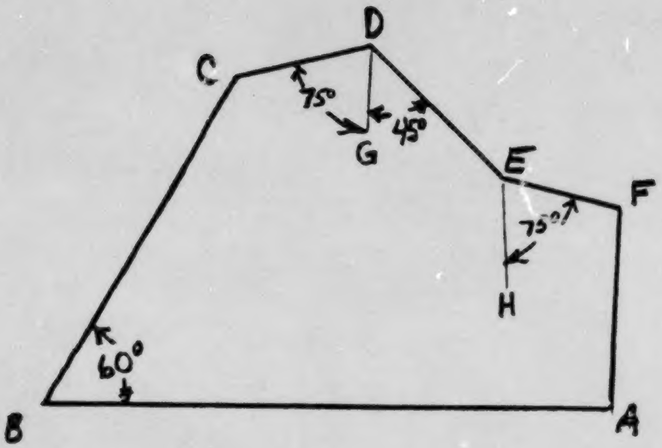
Example 5: Calculate the amount of metal needed to make ④ in square inches.

Example 6:



Enlarge the pattern using the scale isg : 1 in.

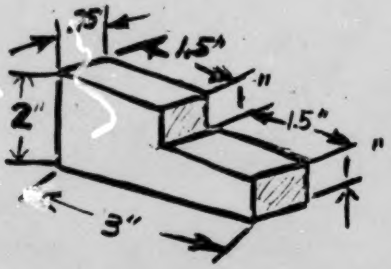
Example 7.



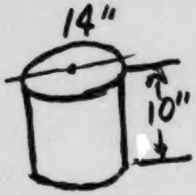
AB = 172 cm
BC = 113 cm
CD = 54 cm
EF = 37 cm
DE = 29 cm
DG = 10 cm
EH = 15 cm

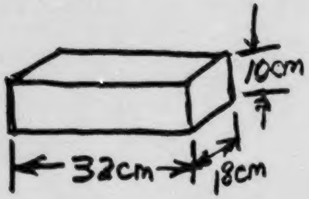
Copy the figure using the scale
1mm : 1 cm

Example 8: Draw two views for the figure.



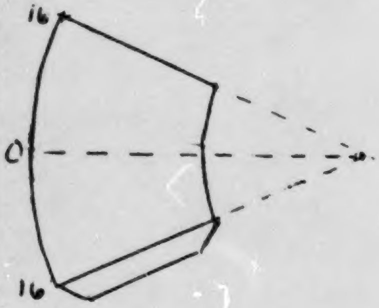
Example 9:

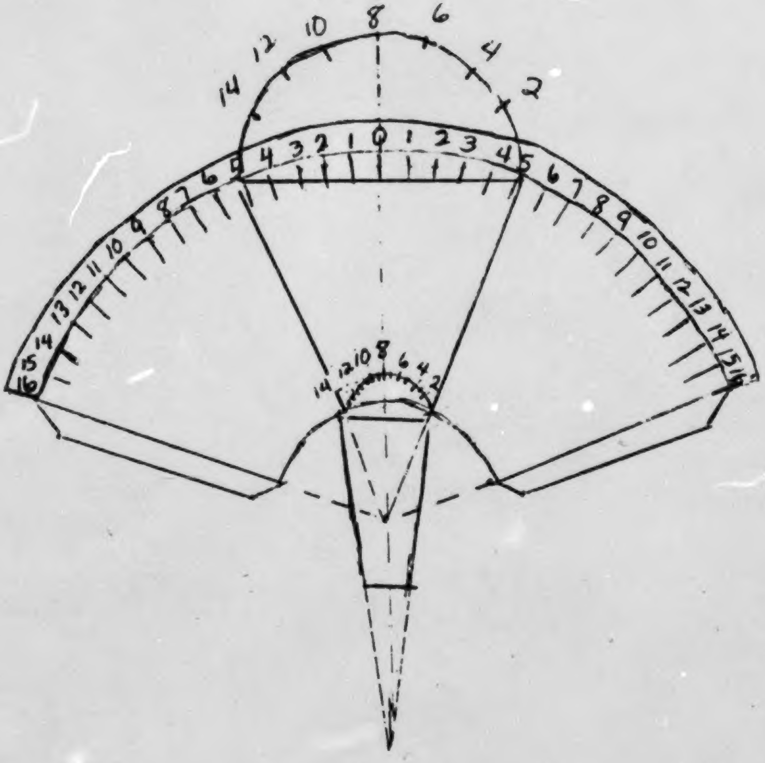




Make a stretchout sketch of the cylinder and the pan.

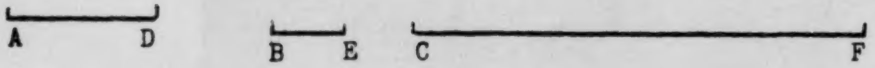
Example 10: What type of layout is illustrated below?





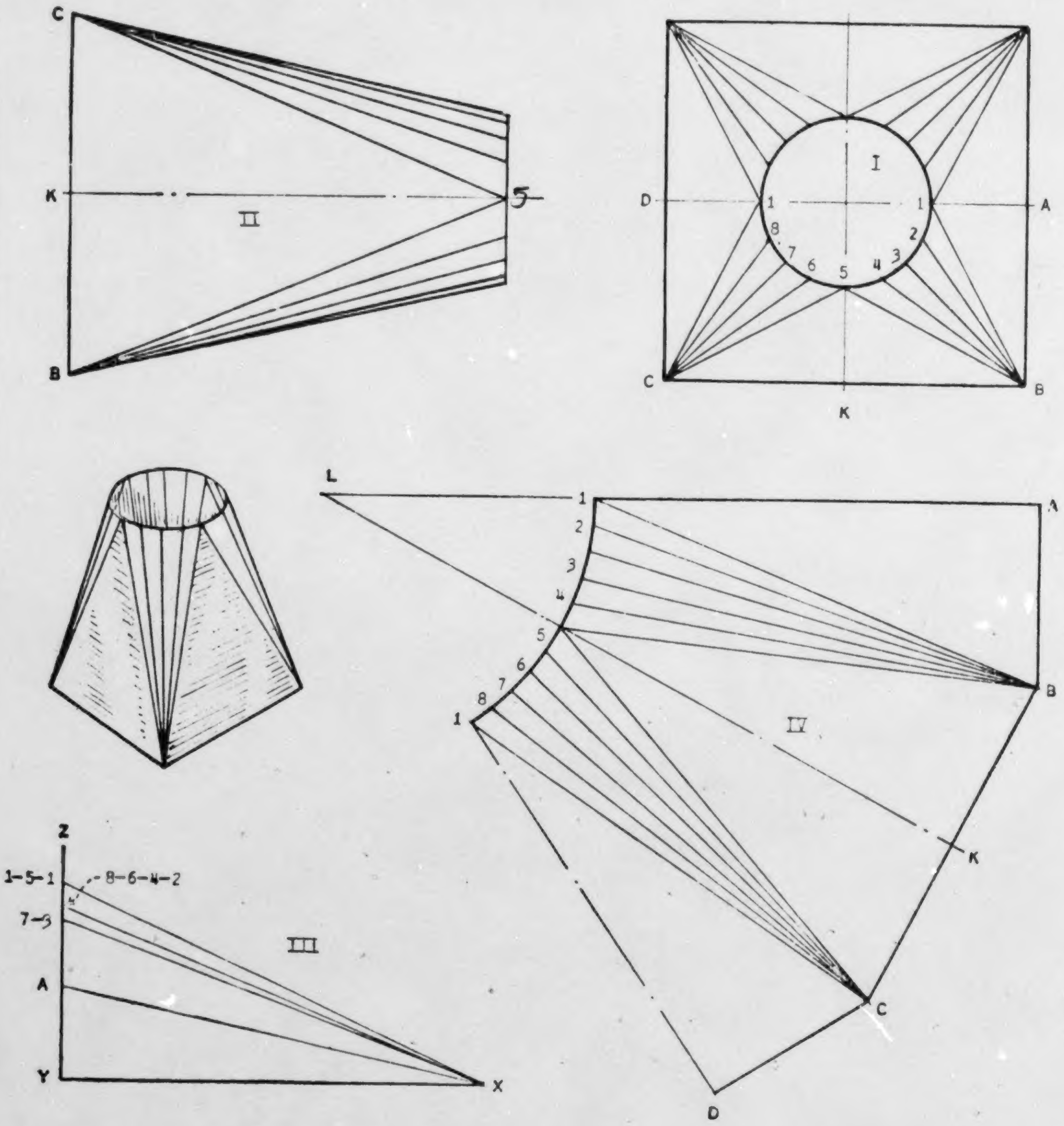
Example 11: The tolerance is stated as 97.50" ± .002.
What does this mean?

Example 12: Measure in 1/4", 1/8", 1/16" and mm.



AD ____ ____ ____ ____
BE ____ ____ ____ ____
CF ____ ____ ____ ____

Example 13: Construct a pattern for a piece with a circular top of diameter 12.5" and square base of side 10", height K5 is 13 inches.



TRIANGULAR DEVELOPMENT OF A TRANSITION.

From Stieri, Sheet Metal Principles and Procedures

Cluster	Manufacturing
Occupation	
Guide	Welding (Arc) #9712

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

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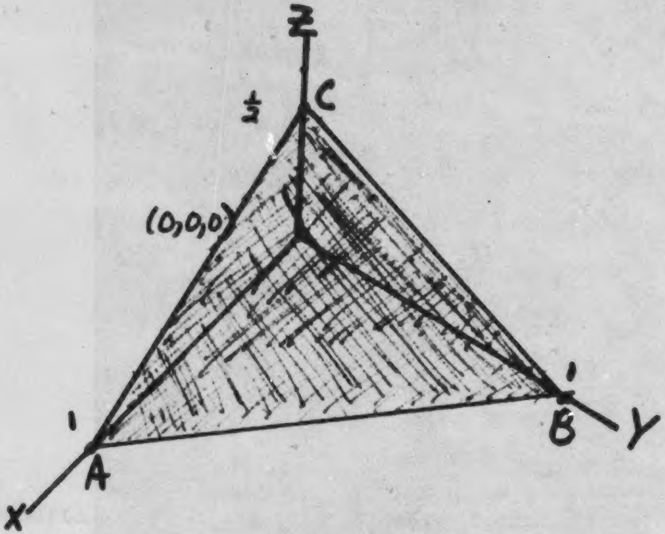
MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Three-dimensional graphing	Advanced geometry (solid)	Understand metallurgy theory (Miller indices) See Appendix Problem 1.	Physics	
Comparison of decimals, operations with decimals	General Math	Understand metallurgy theory (microscopic examination), cutting pieces, reading blueprints. See Appendix Problem 2.	Physics Chemistry	
Measure, estimate angle size, radius, diameter of circle	Geometry, Intuitive Geometry	Position weld, measure joint angle, recognize diameter of pipe. See Appendix Problem 3.	Physics, Art	
Measurement	Basic Math Intuitive Geometry	Cut pieces of stock, read blueprints, follow verbal and written directions. See Appendix Problems 4, 5, 6, 7.	Science, Art	Measurement to 1/16". Use of fractions, use of metric

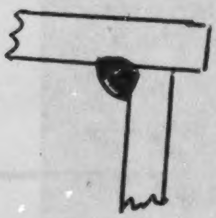
Example 1:



Find the Miller Indices of ABC

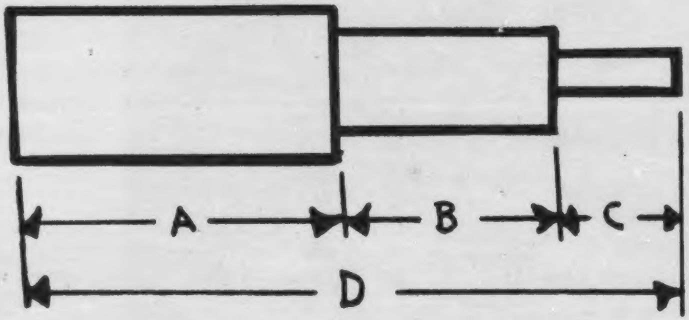
Example 2: An electron microscope has resolution attainable of .002 microns (0.000000078"). Which magnification? How many times?

Example 3:



At what angle would this weld be made?

Example 4:



Measure each part to the nearest 1/16 in.; to the nearest mm.

A ________ ________

B ________ ________

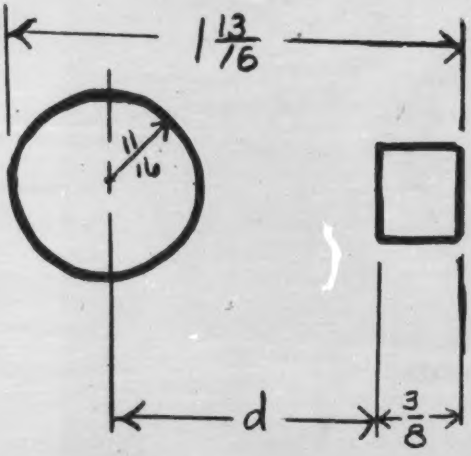
C ________ ________

D ________ ________

Example 5: Three pieces of steel bar are sawed off. Each is 5 9/16 inches remains. How long was the bar originally? ________

Example 6: We have a rod 66.3 cm long. How many 120 mm pieces can we make? ________ How much is left over? ________

Example 7:



Find d in inches.

Cluster Manufacturing

Occupation

Guide Welding (Arc, Advanced) #9713

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

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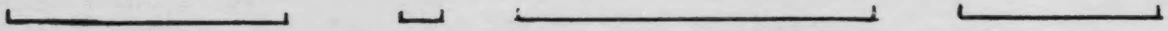
MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measure to 1/16" to nearest mm.	General Math Geometry	Read blueprints, cut pieces of stock. See Appendix Problems 1, 2.	Science, Home Ec, Foods, General Shop, Tailoring	
Fractions	General Math	Read blueprints, cut pieces of stock, figure material usage plus prices. See Appendix Problems 1, 2, 3, 4, 6, 7, 9.	Science, Home Ec, Foods, General Shop, Tailoring	
Decimals	General Math	Read blueprints, cut pieces, figure material usage and prices. See Appendix Problems 2, 5, 8, 9.	Science, Home Ec, Foods, General Shop	
Measure Angles, know radius, diameter, arc, parts of circle, estimate angles	Geometry, Intuitive Geometry	Understand blueprints, understand joint preparation, estimate angle of arc.	Physics, Shop Areas	
Basic whole numbers and money operations, writing money figures	Basic math, Business Math	Prepare a bill and costs of materials, fill in orders, determine actual cost of product from material costs and labor scales, billing forms, financial records. See Appendix Problems 10, 11.	Business (this area designed to be team taught)	
Multiplication of percents	Basic Math, Business Math	Figure tax on billing forms. See Appendix Problem 11.	Business	

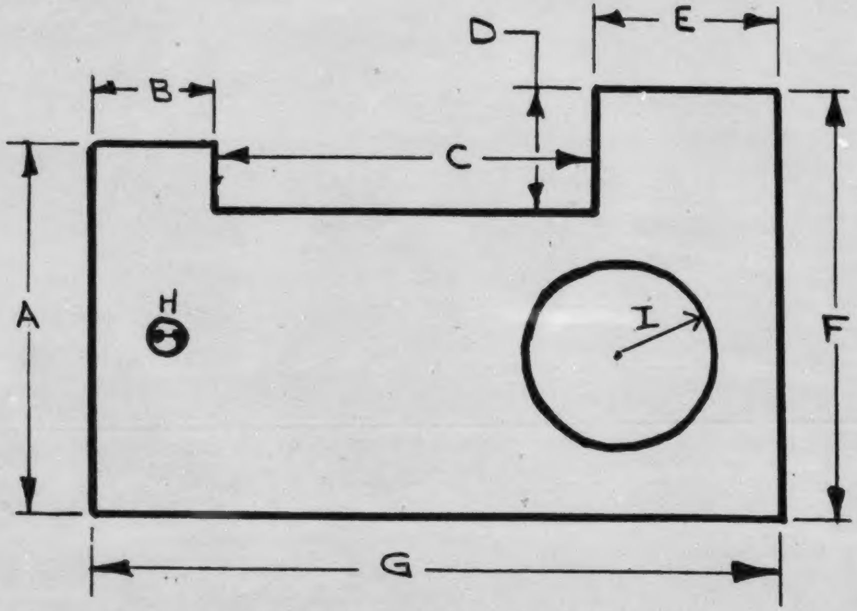
Appendix

Example 1: Measure each line to the nearest 1/16 in. Write fractions in reduced form.



A ____________ B ________ C ____________ D ________

Example 2:

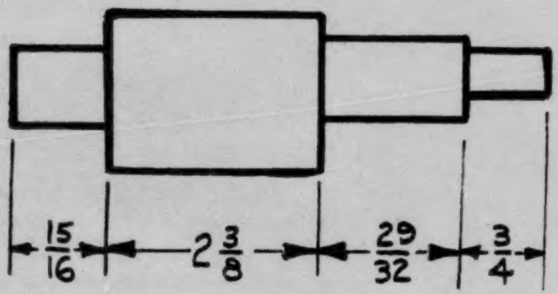


	In.	MM.
A		
B		
C		
D		
E		
F		
G		
H		
I		

Measure each part of the blueprint to the nearest 1/16 in.; to the nearest mm.

Appendix

Example 3:



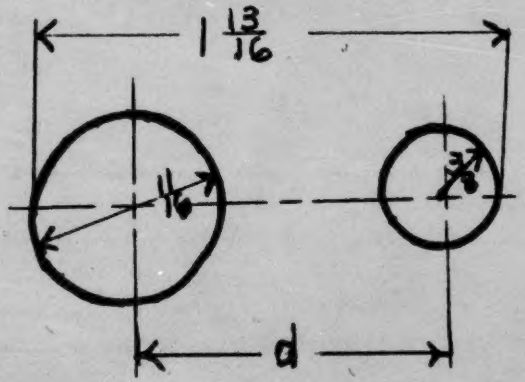
Find the overall length of the shaft.

Example 4: Three pieces of a steel bar are sawed off. Each length is 5 9/16 inches long. If 2 7/8 inches remains, how long was the bar originally?

Example 5: If we have a piece of rod 66.3 cm long, how many pieces, each 120 mm long, can we make? What was left over?

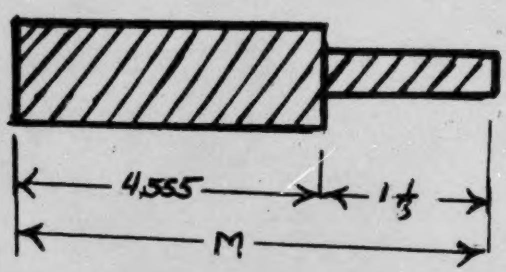
Example 6: Four pieces of tubing each 2 5/8 inches long are taken from a rod 24 1/2 inches long. What amount remains?

Example 7:



Find d in inches

Example 8:



What is M in thousandths of an inch?

Example 9: Fill in the missing dimensions from this table based on a shop blueprint.

Finished Dimension	Nominal Dimension	Upper Limit	Lower Limit	Total Tolerance
$1.270 ^{+.004}_{-.000}$				
$.865 ^{+.001}_{-.002}$				
$7/8 \pm \frac{1}{64}$				
$.725 \pm .0005$				

Example 10: Materials used in Sam's project cost $34.87, $18.94, and $1.87. The labor scale was $8.00 an hour for 3.4 hours. What is the actual cost of the project?

Example 11:

SAM'S WELDING	______, 19 ___		
Item		Cost	
Total	Sub total		
	Tax		
	Total		

Fill in the information from problem 10 on the billing form.

Cluster Manufacturing

Occupation

Guide Welding (Basic) #9710

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

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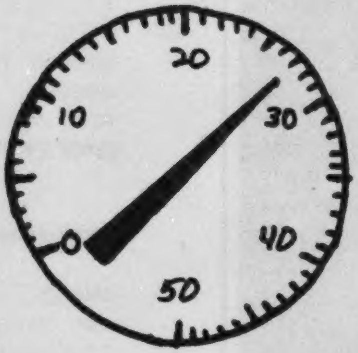
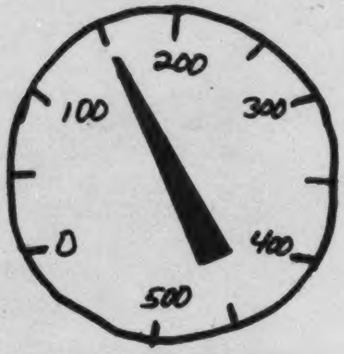
MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Read a scale	General Math	Read regulator, pressure gage, set controls. See Appendix Problem 1.	Science, Home Economics	
Angle measure	Geometry, Intuitive Geometry	Measure welding angles, estimate. See Appendix Problem 5.	Science, Art	
Read a table	General Math	Find machine settings and data for welding. See Appendix Problem 6.	Science, Social Sciences, Economics.	
Measurements (inches, fractions and decimals, metric)	General Math	Measure parts and patterns. See Appendix Problem 4.	Science, Art, Home Economics	
Ratios	General Math	Understand convexity and melting ratios. See Appendix Problems 2,3.	Science, Art, Economics	
Basic Operations with whole numbers, fractions, decimals.	General Math	Read gages, figure materials. See Appendix Problem 1.	Science, Art Economics	

Example 1:

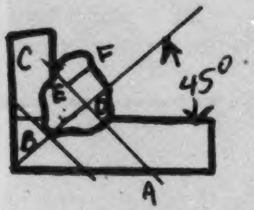




What is the reading on the acetylene gage above?

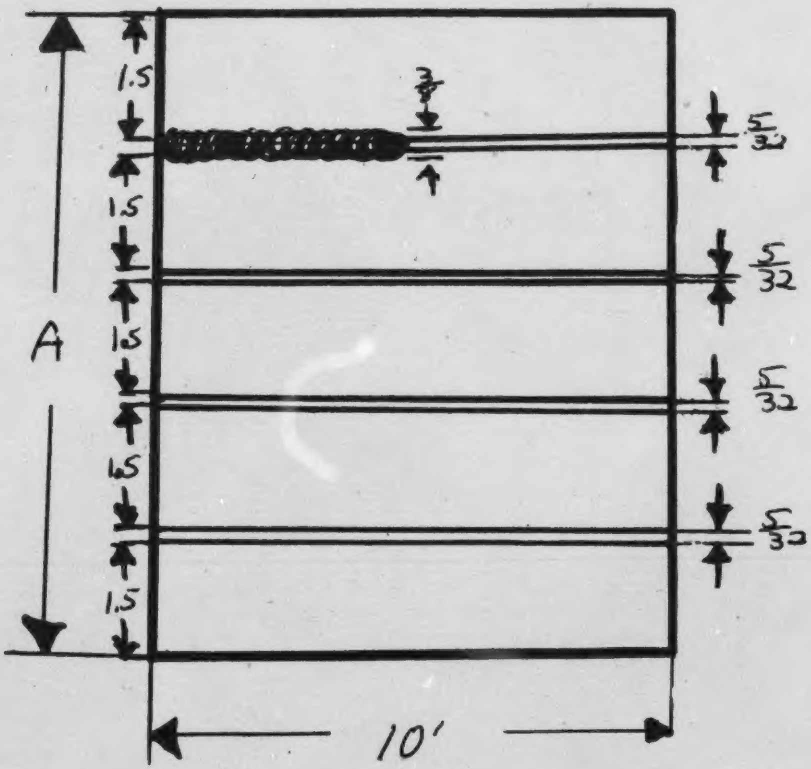
Example 2: What is meant by melting ratio?

Example 3:



What is the convexity ratio
(define and give formula)?

Example 4: Find A on the section of blueprint at right.

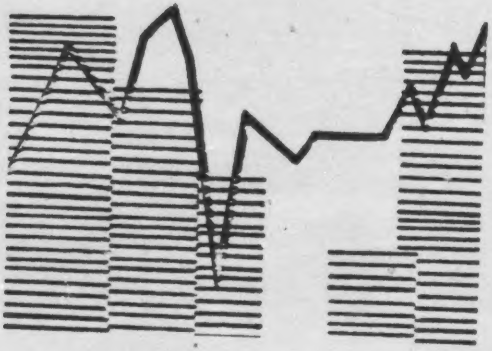


Example 5: What angle is used for overhead welding?

Example 6: What is the decimal equivalent and closest fraction for a drill size 10? (use chart.)

Fraction or drill size	Decimal equivalent	Tap size	Fraction or drill size	Decimal equivalent
Number size drills 80	0.0135		26	0.1470
79	0.0145		25	0.1495
1/64	0.0156		24	0.1520
78	0.0160		23	0.1540
77	0.0180		5/32	0.1562
76	0.0200		22	0.1570
75	0.0210		21	0.1590
74	0.0225		20	0.1610
73	0.0240		19	0.1660
72	0.0250		18	0.1695
71	0.0260		11/64	0.1719
70	0.0280		17	0.1730
69	0.0292		16	0.1770
68	0.0310		15	0.1800
1/32	0.0312		14	0.1820
67	0.0320		13	0.1850
66	0.0330		3/16	0.1875
65	0.0350		12	0.1890
64	0.0360		11	0.1910
63	0.0370		10	0.1935
62	0.0380		9	0.1960
61	0.0390		8	0.1990
60	0.0400		7	0.2010
59	0.0410		13/64	0.2031
58	0.0420		6	0.2040
57	0.0430		5	0.2055
56	0.0465		4	0.2090
3/64	0.0469	0-80	3	0.2130
55	0.0520		7/32	0.2187
54	0.0550	1-56	2	0.2210
53	0.0595	1-64, 72	1	0.2280
1/16	0.0625		Letter size drills A	0.2340
52	0.0635		15/64	0.2344
51	0.0670		B	0.2380
50	0.0700	2-56, 64	C	0.2420
49	0.0730		D	0.2460
48	0.0760		1/4—E	0.2500
5/64	0.0781		F	0.2570
47	0.0785	3-48	G	0.2610
46	0.0810		17/64	0.2656
45	0.0820	3-56, 4-32	H	0.2660
44	0.0860	4-36	I	0.2720
43	0.0890	4-40	J	0.2770
42	0.0935	4-48	K	0.2810
3/32	0.0937		9/32	0.2812
41	0.0960		L	0.2900
40	0.0980		M	0.2950
39	0.0995		19/64	0.2968
38	0.1015	5-40	N	0.3020
37	0.1040	5-44	5/16	0.3125
36	0.1065	6-32	O	0.3160
7/64	0.1093		P	0.3230
35	0.1100		21/64	0.3281
34	0.1110	6-36	Q	0.3320
33	0.1130	6-40	R	0.3390
32	0.1160		11/32	0.3437
31	0.1200		S	0.3480
1/8	0.1250		T	0.3580
30	0.1285		23/64	0.3594
29	0.1360	8-32, 36	U	0.3680
28	0.1405	8-40	3/8	0.3750
9/64	0.1406		V	0.3770
27	0.1440		W	0.3860

MARKETING & DISTRIBUTION



WHAT IS THE MARKETING AND DISTRIBUTION CLUSTER?

It is the study of the processes of buying and selling products and services. Buying and selling involves advertising, transporting, storing and other functions that are a part of our everyday life.

Student activities may include designing, operating and managing a school store. It may also include operating a cash register, setting up store displays, learning sales techniques and receiving actual on-the-job work experience.

Instructional areas would include retail store management, advertising, display, salesmanship and cashier-checker.

Everything that is produced in the business world must be sold, and it takes sales and marketing professionals to bring people and products together.

SUGGESTED COURSE OFFERINGS
LEADING TO OCCUPATIONS
IN THE
MARKETING AND DISTRIBUTION AREA

ADVERTISING ASSISTANT

Suggested Courses:
- Advertising
- Merchandising
- Display and Promotion

BANK TELLER TRAINEE

Suggested Courses:
- Elements of Accounting
- Accounting Procedures
- Accounting Systems
- Office Machines
- Banking Preparation I
- Banking Preparation II
- Banking Preparation III

CASHIER CHECKER TRAINEE

Suggested Courses:
- Merchandising
- Elements of Accounting
- Cashier Checker

DISPLAY TRAINEE

Suggested Courses:
- Display and Promotion
- Individualized Instruction in Display and Promotion II
- Individualized Instruction in Display and Promotion III
- Advertising

FASHION COORDINATOR ASSISTANT MERCHANDISE TRAINEE AND STOCK PERSON

Suggested Courses:
- Fashion Merchandise I
- Fashion Merchandise II
- Merchandising
- Customer Relations
- Creative Fashions

GROCERY STORE MANAGER TRAINEE, GROCERY STORE CASHIER CHECKER AND GROCERY STORE STOCK PERSON

Suggested Courses:
- Grocery Store Management
- Cashier Checker
- Elements of Accounting
- Customer Relations

RETAIL STORE MANAGER TRAINEE

Suggested Courses:
- Retail Store Design
- Retail Store Operation
- Retail Store Management
- Elements of Accounting
- Accounting Procedures
- Merchandising
- Salesmanship
- Advertising

SALESPERSON

Suggested Courses:
- Salesmanship
- Advertising
- Merchandising
- Cashier Checker
- Customer Relations

SMALL BUSINESS MANAGER TRAINEE

For: Auto Body Shops, Auto Parts Stores
Restaurants, Service Stations,
Transportation Managers,
Warehouse and Wholesalers

Suggested Courses:
- Small Business Management
- Small Business Operations
- Small Business Finance
- Elements of Accounting
- Accounting Procedures
- Accounting Systems
- Business Recordkeeping Systems
- Business Recordkeeping Procedures

Cluster Marketing and Distribution

Occupation

Guide #9782 Display and Promotion

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 383 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
One-and two-point perspective	Geometry, Intuitive Geometry	Making perspective drawings, using principles in designing display See Appendix Notes 1,3	Window design, contest design, advertising, art class	
Measurement (English, metric)	Basic Math, Geometry	Used in lettering signs, planning displays, enlarging See Appendix Notes 2,4	Art class	
Spatial relationships	Geometry	Arranging a display of two- and three-dimensional objects See Appendix Notes 3,5	Art class Architecture	
Proportion	Basic Math Geometry	Used in enlarging a design for display purposes See Appendix Note 4	Art, Printing	

APPENDIX

NOTES FOR MARKETING, DISPLAY AND PROMOTION, 9782

1. Using a yardstick, cut a sheet of butcher paper 2 ft. by 1½ ft. Make a two-point perspective sketch of the building with a distance of 16 inches between focal points.

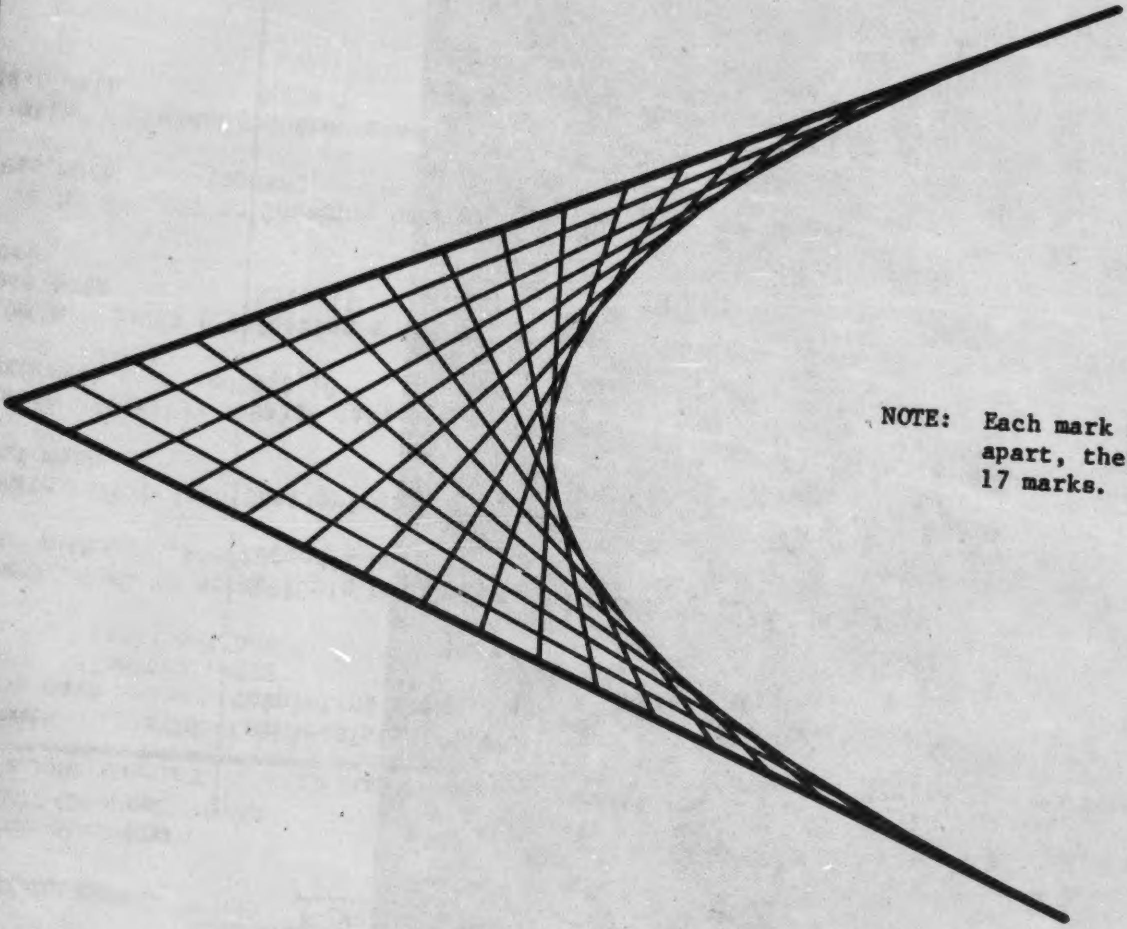
2. Using one-half inch capital letters, hand letter your name on a placard with a one and one-half inch border on all sides.

3. Make a simple dimensional sketch of the card file box, using the actual dimensions of the front and foreshortening the sides to the vanishing point.

4. Enlarge this geometric design to sides about 8½ inches. Use only a ruler, not an overhead projector to trace it. (Copy the angle by tracing a pattern). See following sheet.

5. Select at least seven objects, draw an appropriate two-dimensional background and arrange the objects in a window display.

Appendix



NOTE: Each mark is 1c. apart, there are 17 marks.

Cluster Marketing and Distribution

Occupation ______________

Guide Checker Training #9790

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 386 of ____

Math Concept Taught	Course No. and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Add, subtract, multiply whole numbers, decimals, and fractions	Basic math Business math	Cash register records Completing sales slips See Appendix Notes 1,2		
Division of whole numbers, rounding	Basic math Business math	Multiple pricing (split group prices) See Appendix Note 3		
Fractional division	Basic math Business math	Unit prices See Appendix Note 4		
Percent multiplication	Basic math Business math	Sales tax, discounts See Appendix Notes 5,9,10		
Reading a chart	Basic math Business math Geometry	Reading a sales tax table See Appendix Note 11		
Counting (to make change)	Basic math Business math	Counting back change See Appendix Notes 6,8		
Written numbers	Basic math Business math	Authorizing a check for cashing See Appendix Note 7		

APPENDIX

NOTES ON MARKETING, CHECKER TRAINING, #9790

1. At the end of the day, May 16, H. H. Gray's cash register showed total cash received $146.80, and total cash paid out, $3.20. The cash in the money drawer was $143.15. Prepare a cash proof showing the cash over or short, if any.

Solution: Cash Proof - May 16, 19—

Register total of cash received	$146.80
Register total of cash paid out	3.20
Remainder to be accounted for	$143.60
Cash on hand in money drawer	$143.15
Cash short	$ .45

2. A customer purchases two men's ties at $1.98 each and three pairs of socks at $1.25. He pays for them with a $10.00 bill. The haberdashery department number is 279, the clerk's number is 147. A 4% sales tax applies. Complete the sales slip.

87-6		Michael's		
Dept.	Quantity	Description	$	¢
Clerk				
Date				
Chg [ ] Pd [ ]				
		Tax		
		Total		
Signature ____________				

(Dept. 279 Pd [ ]
Clerk 147
Date (Today's)

2 Men's ties	@ 1.98	3.96
3 pr. socks	@ 1.25	3.75
		7.71
Tax		.32
Total		$8.03)

Appendix (Continued)

3. How much would the sale of quantities below be?

ITEMS	1	2	3	4	5	6
1. price 2/29 cents						
2. price 2/49 cents						
3. price 3/37 cents						
4. price 2/$4.49						
5. price $1.19 ea., 3/$1.50						

4. Find the unit price per pound to the nearest cent.

Weight	Container	Description	Price	Price per lb.
¼ lb.	can	Black pepper	$ .49	
5/8 lb.	jar	Instant coffee	1.29	
4 oz.	pkg.	Nut	.41	

5. John buys a camera for $39.50 and three rolls of film for $1.47 each. Sales tax is 4%. Compute the total amount he must pay.

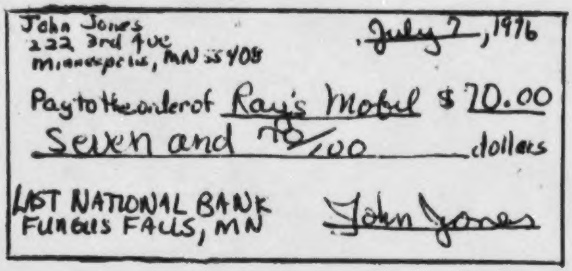
$39.50 3X $1.47 = $4.41
+4.41
$43.91 x .04 = $1.7564, $1.76 /

$43.91
+ 1.76
$45.67

6. The total bill is $13.73. The customer gives you $20. Write out a script showing how you would give back change.

$13.73 and 2 is 13.75." (Give a quarter.) "$14.00."
(Give a dollar) "$15." (Give a $5.) "$20."

7. A customer gives you the check below to authorize. Explain why it might not be negotiable and what it should be rewritten as.



John Jones
222 3rd Ave
Minneapolis, MN 55408

July 7, 1976

Pay to the order of Ray's Mobil $ 70.00

Seven and no/100 dollars

LAST NATIONAL BANK
FUNGUS FALLS, MN

John Jones

"Seventy" should be written in the amount instead of "seven". The written amount must be correct as an extra "o" might have been added to the amount.

8. Complete the form by showing for each problem the number of pieces of each denomination given to the customer.

Amount Received	Amount of Sale	1¢	5¢	10¢	25¢	50¢	$1	$2	$5
$10.00	$5.37								
1.00	.28								
1.00	.59								
5.00	2.17								
10.00	3.49								
1.00	.36								
5.00	1.66								
10.00	3.22								

9. The invoice price of our order is $350. We get a 2% discount. What is our cash price? ($350 x .02 = $7; $3.50 - 7 = $343)

10. A sofa marked "$350" is marked down to $300. What is the discount percent? (350 - 300 = 50 50/350 = 1/7 = 7 ÷ 1.00 = .14 14 2/7%)

Appendix (Continued)

11. MINNESOTA TAX TABLE

Amount of Sale	Tax
$.01 through $.12	no tax
$.13 through $.37	1¢
$.38 through $.62	2¢
$.63 through $.87	3¢
$ over $.87	4¢

Use the tax table and the fact sales tax is 4% to complete the chart below:

Amount of sale	Tax	Total sale
$.98	____________	______________
$3.00	____________	______________
$7.49	____________	______________
$16.63	____________	______________
$20.09	____________	______________

Cluster Marketing and Distribution

Occupation ________________

Guide Grocery Store Mgmt. #9794

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht ____ of ____

Math Concept Taught	Course No. and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Add, subtract whole numbers	General math	Keeping inventory See Appendix Notes 1,2		
Basic decimal and percent operations	General math Business math	Pricing goods, computing markups See Appendix Notes 3,4,5,6		
Know months add on days to compute date	General math	Figuring out invoice terms of payment See Appendix Note 7		
Count change (use of calculator and cash register)	General math	Give change to customer, sell merchandise as check out person See Appendix Note 8		
Percents and use of tables	General math Business math	Figuring tax See Appendix Note 9	Economics	
Writing numbers	General math Business math	Authorizing checks See Appendix Note 10	Science	
Read tables	General math Algebra Concepts Geometry	Read inventory reports and analyze them See Appendix Notes 11,12	Science	
Add, subtract decimals	General math	Cash register records, saleslips See Appendix Note 13		

Cluster Marketing and Distribution

Occupation ________________

Guide Grocery Store Mgmt. #9794

Sht 392 of ____

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Math Concept Taught	Course No. and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Division of fractions and decimals	General math	Unit selling price See Appendix Note 14		
Multiply decimals by whole numbers		Pricing inventory at cost and at retail See Appendix Note 15		

APPENDIX

NOTES ON MARKETING, GROCERY STORE MANAGEMENT 9794

1. Complete the following chart:

No. of Pieces Received	Sales for the week ending July 7						On hand July 9
	Mon.	Tues.	Wed	Thurs.	Fri.	Sat.	
a. 24	2	1	7	2	1	3	
b.	9	6	3	5	7	2	24
c. 18	2	1	1	4	6		2
d. 120	10	16	21	10	15	2	
e.	12	10	10	16	21	16	12
f. 36	5	6	2	1	4	4	
g. 48		8	3	7	10	11	8

APPENDIX (Continued)

2. Set up a control sheet for the following items:

item- women's shoes season- fall ordered on August 3- 53 pr. women's black kid loafers , style 72, A.B.C. Shoe Company. Company: Terms

N/30; cost $2.40, retail $3.98; vendor is assigned #32

Sizes ordered :(narrow and medium widths)

	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10
Narrow	1	1	1	1	2	3	3	3	2	2	1	1	1
Medium	1	1	2	2	3	4	4	4	3	3	2	1	1

The sales record is as follows:

Tues. sold 3 pr. (1pr. 6M; 1pr. 7M; 1 pr. 7½ N)
Wed. sold 5 pr. (1pr. 5½N; 1pr. 6½M; 1 pr. 8M; 1pr. 8½ M; 1pr. 10M)
Thurs. sold 8 pr.(1-7N;1-9N;2-7M;2-8M;2-7½M)
Fri. (1-5½N; 2-7M;3-8M;1-7½M; 1-9N;1-10M); reordered these.
Fri. sold 4 pr. (1-5M;1-6M;1-7N;1-9M)
Sat. sold 2 pr. (1-9M;1-4M)
Sat. 1 pr. 6M returned for credit. A return is circled and entered in red.

APPENDIX (Continued)

		N 4 M	N 4½ M								
		N 9 M									

Months							
Weeks							
On Order							
Rec'd.							
Wk. Sls.							
Daily Sales							
On Hand							

Style No.	Retail:	Description:	Resource:	Cost:	Terms:	Vendors' #

CONTROL SHEET

APPENDIX (Continued)

3. Find the retail price of an article that costs $48.00 if your expenses are $25.00 and your desired profit is $3.00. ($76.00)

4. Sales were $300,000.00; cost of goods were $180,000.00; overhead expenses were $115,000.00; and profit was $5,000.00.
What percent of the sales is the cost of goods?__________
What percent of sales is overhead expenses?__________
What percent of sales is profit?__________

5. Find the markup if cost is $22.00 and retail is $30.00. ($8,00)

6. What is the markup amount if retail is $6.89 and markup percent is 36%?

7. Find the due date on these invoices:

Invoice date	Terms	Date due
June 1	n/10	
July 1	n/60	
Jan 2	n/90	

8. Complete the form by showing the number of pieces of each denomination given to the customer.

Amount received	Amount of sale	1¢	5¢	10¢	25¢	50¢	$1	$2	$5
$10.00	$5.37								
$5.00	$2.17								
$10.00	$3.49								

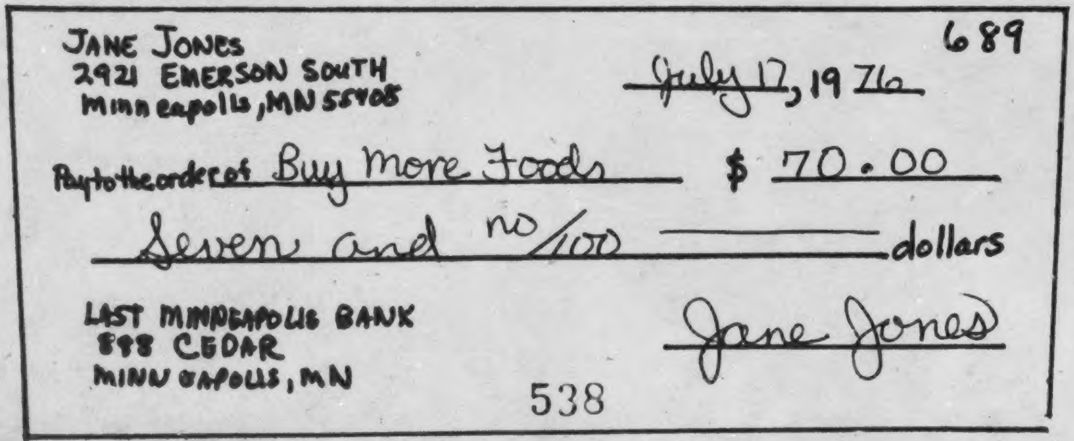
9. MINNESOTA TAX TABLE

Amount of Sale	Tax
$.01 through $.12	no tax
$.13 through $.37	1¢
$.38 through $.62	2¢
$.63 through $.87	3¢
over $.87	4¢

Use the tax table and the fact tax rate is 4% to complete the table:

AMOUNT OF SALE	TAX	TOTAL SALE
$.98	______	________
$3.00	______	________
$7.49	______	________
$16.63	______	________

10. The following check is presented to you for authorization. Why should the check be written over, why might payment be refused and how should it be re-written?
("Seventy" should be written instead of "seven". The written part of the check is used to make sure the numerals were not altered.)



JANE JONES
2921 EMERSON SOUTH
Minneapolis, MN 55408

689

July 17, 1976

Pay to the order of Buy More Foods $ 70.00

Seven and no/100 ________ dollars

LAST MINNEAPOLIS BANK
898 CEDAR
MINNEAPOLIS, MN

Jane Jones

11. Inventory a section of the store assigned by the instructor Record the figures on an inventory form.

12. Check this partial inventory for accuracy. Make any corrections needed.

stock No.	Quantity	Description	Unit price	Value
124	35	fry pans	7.99	279.65
137	58	skillet	19.99	1,159.42
146	76	grill	2.49	189.24
149	154	scrubber	.89	137.06
158	96	hand chopper	2.89	286.08

13. At the end of the day, May 16, Sue's register showed total cash received $146.80, and total cash paid out $3.20. the cash in the money drawer was $143.15. Prepare a cash proof showing cash over or short, if any. (Cash Proof, May 16, 197-

Register total of cash received	$146.80
Register total of cash paid out	3.20
Remainder to be accounted for	$143.60
Cash on hand	$143.15
Cash short	$ .45)

14. If the price of a 1-3/4 lb. box of rice is 84¢, what is the price per pound? (48¢)

15. As part of his inventory of the dairy section he found jack cheese selling at $2.05 a pound, costing $1.36 a pound was in the case in 34 pound packages. Find the inventory prices at cost and at retail. ________ ________

Cluster Marketing and Distribution

Occupation ________________

Guide Retail Store Design #9808

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

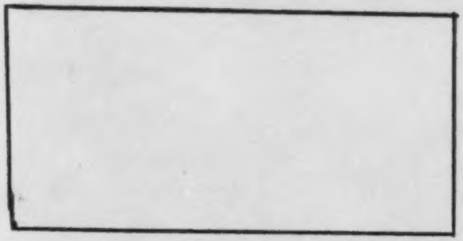
Sht 399 of ____

Math Concept Taught	Course No. and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Scale drawing (measurements in English, metric; conversions using proportions)	General math Geometry concepts	Creating a floor plan to utilize space effectively and pleasantly for all types of departments/stores See Appendix Note 1	Display work Architecture Art	
Add, subtract, multiply whole numbers, decimals	General math Business math	Compute installment charges, keep cash records, profit and loss statements, balance sheets, See Appendix Notes 2,8,9,10	Sciences Economics	
Division with decimals, change decimals to percents, use of formulas	General math Algebra concepts Algebra	Compute rate of interest on installment plans, compute rate of discount, markup, pricing goods (on cost price or sale price basis) profit and loss statements See Appendix Notes 3,4,5, 6,7,9	Sciences Economics	
Number of days in month, add	General math	Figuring due date on invoices See Appendix Note 11		
Change percent to decimal, multiply by decimal	General math Business math Consumer math	Figuring amount of discount, figuring series discounts, cash discounts See Appendix Notes 12,13,14,15	Sciences Economics	

Appendix

NOTES FOR MARKETING, RETAIL STORE DESIGN, #9808

1. **A.** The diagram of the figure is in scale 3":4'. The length of the diagram measures ________inches, so the length of the object represented is __________ _______. The width of the diagram is _________inches , so the object represented is _________ ______.



B. Design a floor plan for the school store. The room measures 12 feet by 20 feet. Display counters available are 6 feet by 1½ feet (4 of these) and 3 feet by 1½ feet (2 of these). Draw a floor plan on scale 1":2'.

2. Joey Gordon bought a tape player for $163.40 and paid $25.00 down and made 18 payments of $8.25 each. How much was the installment charge? ($10.10)

3. Bob bought a coffee pot at $5.50 down and $3 a month for 6 months. If he had paid cash, the percolator would have cost him $21.50. What yearly rate of interest did he have to pay? (18½%)

4. In the window of a dress shop, a dress is marked "$38.95--was $47.50". What rate was the price reduced? (18%)

5. The Leather Shop pays $23.40 for a briefcase and marks it to sell for $39. What percent of the selling price is the markup? (40%)

6. The owner of The Casual Fashions Shop has to buy dresses for the line that sells at $12.99. He knows that his markup must be 40% of the selling price in order to cover expenses and a satisfactory net profit. What is the highest price he can afford to pay? ($7.79)

Appendix (Continued)

7. A dealer buys an end table for $30. His markup must be 60% of the cost to cover expenses and secure a satisfactory profit. What is the lowest price at which he can sell the table and still make the desired rate of markup? ($48)

8. A $25 petty cash fund was set up by the Charleton Sales Company to be used to meet small miscellaneous expenses that may arise. The following expenses were paid out by the fund during the week of July 18:

July 18 Paid $1.25 for manilla envelopes
July 18 Contributed $2.50 to Heart Fund.
July 19 Paid $1.50 for stamps
July 20 Paid $1.39 for stencils
July 21 Paid 40 cents for carfare
July 21 Contributed $2.00 to Girl Scouts Fund
July 22 Paid 79 cents for correction fluid
July 22 Paid 30 cents for paper clips
July 23 Paid 95 cents for filing folders
July 23 Paid $1.35 for telegram

Fill in the amounts in the petty cash fund book, balance and indicate cash on hand.

Petty Cash Fund		Date	Explanation	Carfare	Postage Telegram	Office Supplies	Miscellaneous
Received	Paid Out						

Appendix (Continued)

9. A high school student operated a small business in his home, selling greeting cards, stationery, school supplies, and similar items. During the month of December, his sales amounted to $210.50; his purchases to $145; and his expenses to $28.70. If his inventory at the end of the month was worth $19.56, how much did he clear? (Show all information on a profit and loss statement.)

10. From the following data prepare a balance sheet as of December 1. Cash, $315.85; value of merchandise, $1,672.80; due from charge customers, $276.40; due from Thomas Duff, $100 on promissory note: value of furniture, $2,400; owed to Franklin Trust Company, $500 on promissory note.

11. The Decorator's Supply Company purchased the following items from the Vincent Paint Company; invoice date May 24; terms 60 days net:

    48 qt. color varnish @ $1.10
    56 qt. enamel @ 1.50
    24 gal. thinner @ 1.75
    36 gal. barn paint @ 2.75
    48 gal. remover @ .75
    180 qt. wall paint @ 1.05
    120 qt. sealer @ .90

    You are to: (A) make the extension, (B) find the total amount of the invoice, (C) find the due date of the invoice.

12. A tennis racket has a list price of $12.50 and a 40% trade discount. What is the amount of the trade discount and the invoice price? ($5, $7.50)

13. A hat has a list price of $12 and an invoice price of $7.20. What is the trade discount amount and the trade discount rate? ($4.80, 40%)

14. An article has a list price of $45.00 and trade discounts of 20% and 10%. What is the invoice price of the article? ($32.40)

15. The date of invoice is July 27; amount of invoice is $450; terms 2/10, n/30; the date paid August 6. Find the amount needed to pay the invoice. ($441)

Cluster Marketing and Distribution

Occupation

Guide #9810 Retail Store Management

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 403 of

Math Concept Taught	Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement	General Math	Lettering and arrangements for advertising signs See Appendix Note 1	Art	
Add, subtract, divide, multiply whole numbers, decimals rounding answers	Basic Math, Business Math	Prepare a budget for school store		
Percents	General Math	Markups, mark downs, discounts, finding retail price, recordkeeping See Appendix Notes 2 - 10		

Appendix

NOTES ON MARKETING, RETAIL STORE MANAGEMENT, #9810

1. On a piece of posterboard 16" by 24" create a sign advertising a product in the store. Measure and hand letter the sign.

2. Find the retail price of an article that costs $48.00 if your expenses are $25.00 and your desired profit is $3.00. ($76.00)

3. Find the cost if the retail price is $19.95 and the markup is $6.00. ($13.95)

4. Find the markup if cost is $22.00 and retail is 30.00. ($8.00)

5. An article has a retail price of $6.89 and the markup percent is 36%. Find the dollar markup. ($2.48)

6. The cost of a new machine is $9,000.00 and the markup is $3,000.000. What is the markup percent? (25%)

7. The cost of an article is $18.00 and the desired markup is 40% of the cost. Find the retail price. ($25.20)

8. Merchandise costs $21.60 per dozen. If a buyer wishes to make a 40% markup of retail, what should he sell each piece for? ($3.00)

9. $900.00 worth of merchandise is discounted 5%. Find the amount of the discount. ($45.00)

10. A swimsuit has a marked price of $13.00 and is sold on sale for $9.75. Find the amount and percent of discount to put on the sale sign. ($3.25; 25%)

Cluster Marketing and Distribution

Occupation ____________

Guide #9809 Retail Store Operation

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht405 of ____

Math Concept Taught	Course No. and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Counting money	General Math, Business Math	Making change, See Appendix Note 1	Vocational areas such as foods, small business etc.	
Writing money numbers		Accepting checks, See Appendix Note 2		
Add, subtract, multiply--whole number, decimals		Writing up saleslips, pricing merchandise markup, See appendix Note 3,4,5	Science, vocational areas such as foods	
Checking accuracy using basic arithmetic to fill out orders (calculator also)		Ordering merchandise, checking in merchandise See Appendix Note 6,7		
Days in months (addition)		Compute due date on invoice, See Appendix Note 8	Business courses	
One-to-one correspondence	Math Concepts, Basic Math	Reading, devising price codes, See Appendix Note 9,10		
Compute percents	General Math Business Math	Percent of markup, figuring markup, See Appendix Note 11,12,13,14		
Multiply decimals				

APPENDIX

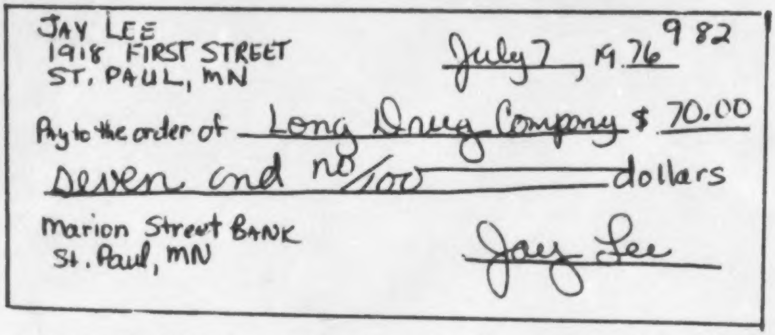
NOTES ON MARKETING, RETAIL STORE OPERATION, #9809

1. Complete the form by showing for each problem the number of pieces of each denomination given to the customer.

Amount received	Amount of sale	1¢	5¢	10¢	25¢	50¢	$1	$2	$5
$10.00	$5.37								
$1.00	$ .28								
$1.00	$ .59								
$5.00	$2.17								
$10.00	$3.49								
$1.00	$ .36								
$5.00	$1.66								
$10.00	$3.22								

APPENDIX (Continued)

2. A customer gives you the check below. Explain why it might not be negotiable and what it should be rewritten as.



JAY LEE
1918 FIRST STREET
ST. PAUL, MN

July 7, 19 76 982

Pay to the order of Long Drug Company $ 70.00

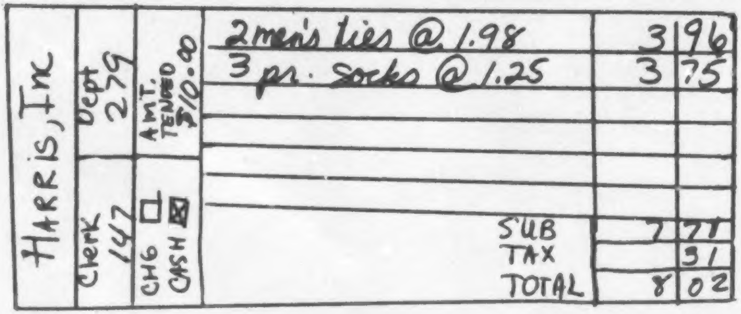
Seven and no/100 dollars

Marion Street BANK
St. Paul, MN

Jay Lee

("Seventy" should be written in the amount instead of "seven". The written amount must be correct as an extra "0" might have been added to the amount.)

3. A customer purchases two men's ties at $1.98 each and three pairs of socks at $1.25. He pays for them with a $10.00 bill. The haberdashery department number is 279, the clerk's number is 147. A 4% sales tax applies. Complete the sales slip.



HARRIS, INC

Dept 279

Clerk 147

AMT. TENDERED $10.00

CHG ☐ CASH ☒

2 men's ties @ 1.98	3	96
3 pr. socks @ 1.25	3	75
SUB	7	71
TAX		31
TOTAL	8	02

4. Find the retail price of an article that costs $48.00 if your expenses are $25.00 and your desired profit is $3.00. ($48+25+3=$76)

5. Find the markup if the cost is $22.00 and the retail is $30.00. (M = R - C = $30.00-$22.00 = $8.00)

6. On March 8, 197- the following merchandise is purchased from Diane Fashions, 13 West Road, Laurelton, New York. The terms are 5/30, F.O.B. the store:

6 dresses- style #82, assorted colors at $19.00 each; sizes
1-8, 1-10, 2-12, 1-14, 1-16

12 sweaters style #76, 4 each of sizes sm., med., lg.; colors:
3/blue, 4/pink, 2/green, 3/orange, at $3.00 each

8 skirts- style #19; assorted sizes and colors, at $4.80 each

10 blouses- assorted styles and sizes, white, at $1.80 each

This order is to be delivered on June 1, to the store. The required M% is 40% of retail. Prices should end in 99. Complete the order.

Appendix (Continued)

7. You are asked to prepare an invoice for the D. E. Sales Lab., Centerville, New York (you are employed by Ralph's Sporting Goods Company, South Road, West Bend, New York) on December 1, 197—. Your company offers terms of N/20 F.O.B. Factory. The merchandise order is as follows:

6 - rubber rafts at $32.00 each
12 - paddles at $2.40 each
3 - tents at $96.20 each
6 - tents at $37.50 each
1 - doz. sleeping bags
15 - Inflatable mattresses at $7.28 ea.

½ doz. air pumps at $7.20/doz.
21 - canteens at $3.55 each
24 - mess kits at $2.19 each
2 - doz. tent poles at $8.20/doz.
6 - doz. tent stacks at $.76/doz.

D. E. Sales Lab
1165 Central Avenue
Albany, New York - 12205

Ordered from: ______________________

Date: ______________________

Order No. 976231

Terms: ______________________

F.O.B. ______________________

Ship Via: ______________________

Ship to: ______________________

Delivery Date ______________________

QUANTITY	UNIT	DESCRIPTION	COST	COST EXTENSION	RETAIL PRICE/ SINGLE UNIT
		TOTAL COST			

Total Retail

Signed ______________________

Required M% ______________________

Approval ______________________

Actual Markup ______________________

APPENDIX (Continued)

8. Compute due date:

Invoice Date	Terms	Date Due
Aug. 25	N/5EOM	________
Jan. 15	N/20 EOM	________
July 29	N/10 EOM	________
June 10	N/20	________
March 1	N/30	________

9. You are to mark this ticket. The cost code is ABCDEFGHIJ, department is #450. Price: $39.50; cost $25.00 Size 14

(Dept.) ________

(Season) ________

(Cost code) ________

(Size) ________

(Retail price) ________

10. The cost code is QUICKSANDY. Determine the cost for these:

SDY ________ QUY ________ IAN ________ SICK ________

11. The retail price of a purse is $6.89 and the markup percent is 36%. Find the dollar markup

12. The cost is $9,000.00, markup $3,000.00. Find the markup percent.

13. The cost is $18.00, markup percentage is 40% of retail. Find the retail. ($30.00)

14. You can purchase sweaters for $7 each. If your desired markup is 40% of retail, what would your selling price be?

RALPH'S SPORTING GOODS
South Road
West Bend, New York

Number 796231

SOLD TO ______________________
____
____

Date: ______________________

Terms: ______________________

F.O.B. ______________________

Quantity	units	Description	Price	Extension
			Total Cost	

PERSONAL SERVICES

WHAT IS THE PERSONAL SERVICE CLUSTER?

Careers included in the personal services area are child care and development occupations, fashion and apparel occupations, and grooming services. Child care centers, nursery schools, public schools as assistants, teachers, directors and consultants. Fashion and apparel occupations span a wide range of career opportunities including fashion design, production, alterations, coordination, and many others with various educational requirements. Grooming service is an area of exploration and skill-building including cosmetology and barbering careers.

SUGGESTED COURSE OFFERINGS
LEADING TO OCCUPATIONS
IN THE
PERSONAL SERVICE AREA

CHILD CARE TRAINEE

Suggested Courses:
- Occupational Child Care I
- Occupational Child Care II
- Occupational Child Care III

CHILD CARE ASSISTANT

Suggested Courses:
- Exploring Child Development I
- Exploring Child Development II
- Exploring Child Development III

COSMETOLOGY TRAINEE

Suggested Courses:
- Cosmetology I
- Cosmetology II
- Cosmetology III
- **Available to 11th and 12th grade students only

DRY CLEANING ASSISTANT

Suggested Courses:
- Dry Cleaning
- Individualized Instruction in Dry Cleaning I
- Individualized Instruction in Dry Cleaning II

APPAREL ARTS SPECIALIST

Suggested Courses:
- Apparel Arts I
- Apparel Arts II
- Apparel Arts III

FASHION AND APPAREL ARTS TRAINEE

Suggested Courses:
- Fashion and Apparel Arts I
- Fashion and Apparel Arts II
- Fashion and Apparel Arts III

INTERIOR DESIGN ASSISTANT AND FASHION DESIGN ASSISTANT

Suggested Courses:
- Creative Fashion I
- Fashion Tailoring II
- Interior Fashion III

TAILORING TRAINEE

Suggested Courses:
- Clothing Construction I
- Clothing Construction II
- Tailoring I

Cluster Personal Services

Occupation ________________

Guide Apparel Arts #9831

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 416 of ____

Math Concept Taught	Course No. and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Chart reading (fractions)	Basic Math Used in trig, geometry	Reading the chart of fractions on the pattern to determine material needed to make a given pattern; reading a size chart to determine pattern size personal sewing, professional sewing tailoring (See Appendix I).		
Add, subtract, multiply fractions, whole numbers, decimals	Basic Math	Applying use of numbers to determine amount of material needed when patterns are combined or multiple garments are constructed. (With use of metric measures in patterns, decimals and a basic knowledge of metric system becomes important). See Appendix I		
Read a ruler (1/2", 1/4", 1/8")	Basic Math Geometry	Constantly needs to read for seam width when sewing, measuring customer to fit pattern, measuring materials, hems--personal & professional sewing, tailoring. See Appendix IV		
Estimating measures (1/4", 1/2", 5/8")	Basic Math Geometry	Very necessary to attain professional speed and accuracy in sewing, estimating seam measures. Demonstrate use of commercial seam (1/2") and pattern seam (5/8"). See Appendix IV		
Using measuring tools	Basic Math Geometry	Rapid, accurate use of gauge, ruler, yardstick, tape measure to measure cloth, seams, mark garments, fit pattern. See Appendix II		
Cash discounts	Business Math General Math	Supportive in figuring commercial allowances and for estimating garment cost and price. See Appendix III		
Knowledge of metric measures of length	Basic Math	Supportive in preparing for conversion to metric patterns		

APPENDIX I - Pattern Chart

4235 MISSES' JACKET, BRA TOP, SKIRT & PANTS **11 PIECES**

Loose fitting, unlined jacket gathered into one-piece yoke has cardigan neckline, short sleeves with turned back cuffs, and topstitch trim. Bra top, elasticized under bust, has back button closing and topstitch trim. Flared skirt in two lengths and slightly flared pants have elasticized waistline and optional attached self bows. Purchased hat and scarf.

Pattern Size For Moderate Stretch Knit Fabrics Only.

BODY MEASUREMENTS					
Size	8	10	12	14	16
Bust	31½	32½	34	36	38
Waist	24	25	26½	28	30
Hip	33½	34½	36	38	40
Back Waist Length	15¾	16	16¼	16½	16¾

BUST	31½	32½	34	36	38
SIZES	8	10	12	14	16
JACKET					
44/45" wo nap	1½	1½	1½	1½	1½
60" wo nap	1¼	1¼	1¼	1¼	1¼
BRA TOP (Illustrated in Crosswise Stripe)					
44/45",60" wo nap	½	½	½	½	⅝
BRA TOP LINING					
44/45" Tricot	½	½	½	½	⅝
LONG SKIRT (Illustrated in Crosswise Stripe)					
44/45" wo nap	2⅝	2⅝	2⅝	2⅝	2⅝
60" wo nap	2⅜	2⅝	2⅝	2⅝	2⅝
SHORT SKIRT					
44/45" wo nap	1¾	1¾	1¾	1¾	1¾
60" wo nap	1	1	1⅛	1⅛	1⅜
PANTS					
44/45" wo nap	2½	2⅝	2⅝	2⅝	2¾
60" wo nap	1⅜	1⅜	1⅜	1⅝	2

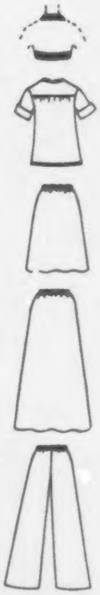
Obvious diagonal fabrics are not suitable. Allowance for matching plaid and stripes not included in yardages given.

w: with nap, shading, pile or one-way design.
wo: without nap, shading or pile or with a two-way design.

Width at lower edge					
Jacket	45	46	47½	49½	51½
Long Skirt	78¾	80	81¾	83	83
Short Skirt	60	61¼	63	65¼	65¼
Pants (each leg)	23¼	23¾	24½	25½	26½
Finished back length from base of neck					
Jacket	25¾	26	26¼	26½	26¾
Finished back length from waist					
Long Skirt	40¼	40½	40¾	41	41¼
Short Skirt	24½	24¾	25	25¼	25½
Finished side length from waist					
Pants	41½	41¾	42	42¼	42½

FABRICS: Use Moderate Stretch ** Knit fabrics such as Cotton Knits and Jersey.
**Use Select-A-Knit™ Gauge to measure knit fabric stretch for this pattern. See envelope side for gauge and tissue for instructions.

NOTIONS: Polyester Thread. Bra Top: Three ½" (line 20) Buttons and ½ yd. of ⅛" Oval Elastic. Skirt or Pants: 1 yd. of ¾" Elastic.



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LONDON • TORONTO • SYDNEY PRINTED IN U.S.A.

APPENDIX I - Use the attached pattern chart to help solve the following:

Jean's measurements are 33½", 26", 35". What size pattern should she buy according to the chart on the pattern?

Jean decides to make the jacket, halter top, and long skirt from one fabric. How much material will it take if the fabric is 60 inches wide?

She will make the pants and a second halter from another fabric that is 44" wide. How much material is needed?

The first fabric costs $3.98 a yard. The second costs $2.49 a yard. What is the total cost of both fabrics Jean needs?

How much each of 1/8 inch and 3/4 inch elastic does she need?

APPENDIX II -

Project - Measure yourself and record the measurements below. Determine your pattern size using the charts in your book.

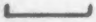
APPENDIX III -

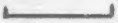
A manufacturer offers a trade discount of 20% on sewing machines listed at $239.80 each. Beth Schmidt, Inc. wants to purchase 30 machines. What was the invoice price?

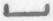
John Mack's Rainwear receives a cash discount of 45% less 10% on all purchases. What single discount is equivalent to this chain of discounts?

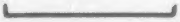
Mr. Stengel received an invoice for $201.66 with terms 2/15, n/45. The invoice was dated March 23. He paid on April 7. How much should he pay?

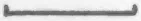
APPENDIX IV - Estimate the length of these lines. Then measure to the nearest 1/8th inch.

a. 

b. 

c. 

d. 

e. 

	estimate	measure
a.		
b.		
c.		
d.		
e.		

Cluster Personal Services

Occupation ________________

Guide Fashion & Apparel Arts I #9879

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 420 of ____

Math Concept Taught	Course No. and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measurement with tape, ruler, yardstick	Basic Math Geometry	Fitting and selecting a pattern and altering a pattern. (See Appendix I) alterations, fashion design.		
Read a chart	Basic Math	Determine pattern size and pattern materials (See Appendix II) same as above.		
Plane and solid figures	Geometry Trig., Intuitive' Geometry	Alterations, design. Projecting a flat surface onto a curved surface and identifying how to alter a pattern. (Experience with spatial problems and manipulations might help build this skill.)	Physics, Science	
Multiply and divide whole numbers, decimals, fractions. Form percents	Basic Math Business and Personal Math	Calculate mark up, mark down, merchandise prices, write a sales slip and directions for alterations, figure taxes, cash discounts, material usage. (See Appendix III)	Business Management, English	
Supplemental- knowledge of metric units of length	Basic Math	Supportive-understanding of the system is becoming increasingly important as the change to metric system is made.		

APPENDIX I -

Project - Measure yourself and record the measurements below. Determine your pattern size using the charts in the pattern book.

APPENDIX II - Use the attached pattern chart to help solve the following:

Jean's measurements are 33½", 26", 35". What size pattern should she buy according to the chart on the pattern?

Jean decides to make the jacket, halter top, and long skirt from one fabric which is 60" wide. How much material will it take?

She will make the pants and a second halter from another fabric which is 44" wide. How much material is needed?

The first fabric costs $3.98 a yard and the second costs $2.49 a yard. What is the total cost of both fabrics Jean needs?

How much each of 1/8 inch and 3/4 inch elastic does Jean need?

APPENDIX III -

MARK UP

If the total cost of goods is $375,000 and the total retail is $500,000
- a. What is the tatal dollar markup?
- b. What percent does this markup represent based on the retail price?
- c. What percent does this markup represent based on the cost price?

MARK DOWN

To increase business in the men's department a jacket ordinarily selling for $23.70 was marked down to $19.75. Find the markdown. Find the rate percent of markdown based on the reduced selling price.

SALES SLIP

See attached sheet.

CASH DISCOUNTS

An invoice for $639.50 is dated Feb. 10 with terms of 5/20, n/60. The invoice was paid on Feb. 28. What was the amount?

If you purchase 12 dresses at a total invoice cost of $48.00, what is the cost of each dress if a 2% cash discount is earned on the invoice amount?

4235 MISSES' JACKET, BRA TOP, SKIRT & PANTS **11 PIECES**

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Pattern Size For Moderate Stretch Knit Fabrics Only.

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60" wo nap	1¼	1¼	1¼	1¼	1¼
BRA TOP (Illustrated in Crosswise Stripe)					
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60" wo nap	1	1	1⅛	1¼	1⅜
PANTS					
44/45" wo nap	2½	2⅝	2⅝	2⅝	2¾
60" wo nap	1⅜	1⅜	1⅜	1⅝	2

Obvious diagonal fabrics are not suitable. Allowance for matching plaid and stripes not included in yardages given.

w: with nap, shading, pile or one-way design.
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Short Skirt	60	61¼	63	65¼	65¼
Pants (each leg)	23¼	23¾	24½	25½	26½
Finished back length from base of neck					
Jacket	25¾	26	26¼	26½	26¾
Finished back length from waist					
Long Skirt	40¼	40½	40¾	41	41¼
Short Skirt	24½	24¾	25	25¼	25½
Finished side length from waist					
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**Use Select-A-Knit™ Gauge to measure knit fabric stretch for this pattern. See envelope side for gauge and tissue for instructions.

NOTIONS: Polyester Thread. Bra Top: Three ½" (line 20) Buttons and ½ yd. of ⅛" Oval Elastic. Skirt or Pants: 1 yd. of ¾" Elastic.

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MERCHANDISING MATHEMATICS **COMPLETING SALESCHECKS**

PRACTICE PROBLEMS

1. Cash/Take

   A customer purchases 2 shirts, code numbers 473C and 477C, at $7.98 ea. and 3 pairs of hose at $1.29 per pair, and paid with $25.00. Your department number is 279. A sales tax of 2% applies.

87-8 **MICHAEL'S**

Dept.	Clerk	Date

Quant.	Description	$	¢
	Tax		
	Total		

Signature: ____________________

Chg.	Pd.	Rec'd.

Charge to: ____________________
Street: ____________________
City: ____________________

87-7 **MICHAEL'S**

Dept.	Clerk	Date

Quant.	Description	$	¢
	Tax		
	Total		

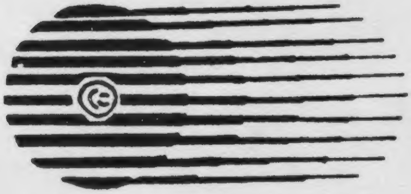
Signature: ____________________

Chg.	Pd.	Rec'd.

Charge to: ____________________
Street: ____________________
City: ____________________

2. John Jones purchases 1 sports jacket for $34.95, 2 pairs of slacks for $16.95 ea., and a belt, size 34, for $2.95. A 2% sales tax applies and he pays for the purchase with a personal check. The department number is 279.

TRANSPORTATION



WHAT IS THE TRANSPORTATION CLUSTER?

It is the study of the technology and socioeconomic problems of transporting goods, services and people. Learning experiences are developed around (1) vehicle associated systems such as power plants, transmission systems, propulsion systems, frame systems and control systems, (2) non-vehicle associated systems such as conveyor systems and pipelines (3) support systems such as parts distribution, fueling and lubrication (4) service and maintenance for the auto, aircraft, marine, rail and recreational vehicles.

Students will be able to compare their talents and interest with occupations in the transportation cluster and may choose to gain a marketable skill in an occupation of their choice.

Instructional areas include: automotive systems, tune-up, alignment and brakes, auto body, recreational vehicles, aviation and transportation systems.

SUGGESTED COURSE OFFERINGS
LEADING TO OCCUPATIONS
IN THE
TRANSPORTATION AREA

AUTO ALIGNMENT AND BRAKE SPECIALIST

Suggested Courses:
- Automotive Systems I
- Automotive Systems II
- Automotive Systems III
- Auto Brakes and Alignment I
- Auto Brakes and Alignment II

AUTO BODY REPAIRMAN

Suggested Courses:
- Automotive Systems I
- Automotive Systems II
- Automotive Systems III
- Auto Body Repair I
- Auto Body Repair II
- Auto Body Repair III

AUTO ELECTRIC SYSTEMS SPECIALIST

Suggested Courses:
- Automotive Systems I
- Automotive Systems II
- Automotive Systems III
- Automotive Tune-Up I
- Automotive Electric I
- Automotive Electric II

AUTO-LITE TRUCK MECHANIC

Suggested Courses:
- Automotive Systems I
- Automotive Systems II
- Automotive Systems III
- Automotive Tune-Up I
- Automotive Brake and Alignment
- Automotive Engines I
- Automotive Engines II
- Automotive Engines III
- Automotive Drive Train I

AUTO TUNE-UP SPECIALIST

Suggested Courses:
- Automotive Systems I
- Automotive Systems II
- Automotive Systems III
- Automotive Tune-Up I

AVIATION CAREERS

Suggested Courses:
- Aviation Orientation I
- Aviation Intern
- Aviation Orientation II
- Aviation Intern II

RECREATIONAL VEHICLE AND SMALL ENGINE REPAIRMAN

Suggested Courses:
- Small Engine Repair I
- Small Engine Repair II
- Recreational and Small Engine Repair
- Motorcycle Repair
- Marine Engine Repair

Clus Transportation

Occupation

Guide Automotive Alignment and Brakes I #9727

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 427

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Areas	Discovery Math Algebra, Geometry, etc	Finding frictional area of brake shoes and drums. (App I) Also disk pads, and cylinders.		
Circumference	Same as above	Find the circumference of brake drums and tires (App I)		
Fractions, +, -	Discovery Math Senior Math, etc.	Figuring tire run-out, wheel weights, vehicle heights. (App II)		
Reading rulers	Discovery Math Senior Math	Vehicle heights (App II)		
Ratio and proportion	Discovery Math, etc.	Mechanical advantage of brakes. (App III)		
Conversion of units	Discovery Math, etc.	Torque - changing ft-lb to in-lb and back (App IV)		
Comparison of fractions	Discovery Math Senior Math	Be able to find the next largest or smallest wrench. (App V)		

APPENDIX I

Example 1: A brake shoe is 2 in wide and a curved length of 6 in. What is the frictional area?

Example 2: A brake drum is 2 in wide and has a diameter of 1 foot. What is the frictional area?

Example 3: You have a 10 in disk brake and the disk pad is 2 inch wide. On the outer edge of the disk, the pad's length is 7.85 inch long and the inner edge is 4.71 inch long. What is the fictional surface of the pad?

Example 4: What is the circumference of a 14 inch tire?

Example 5: What is the surface area of a master cylinder that has the following diameters?

a. 1.35 cm b. 1 in c. 1 1/4 in d. 2.5 cm

APPENDIX II

Example 1: 13/64 inch is the allowed margin for tire run-out. The variance of the side is given in the following. What is the largest margin for the tire to be out of round?

a. 1/16 in	b. 1/8 in	c. 5/64 in
d. 3/64 in	e. 4/32 in	f. 1/64 in

Example 2: You all ready have wheel weights of 1/2 oz. and 3/16 oz. on the wheel. How much would the third weight have to be, if you need a total of 7/8 oz?

Example 3: Measure the height of the desk in your room and the height of your chair seat.

Example 4: Measure the vehicle height of three different models of cars.

APPENDIX III

The mechanical advantage of the force applied to the brakes to the force applied to the brake pedal is 4 to 1. How much force is applied to the brakes when you apply the following forces to the brake pedal?

1. 150 lbs
2. 175 lbs
3. 100 lbs
4. 125 lbs
5. 50 lbs
6. 200 lbs
7. 130 lbs
8. 98 lbs

APPENDIX IV

If your torque wrench has units of ft-lb, what should the reading be if you need the following readings.

1. 18 in-lb = __________ ft-lb   2. 9 in-lb = __________ ft-lb

3. 21 in-lb = __________ ft-lb   4. 100 in-lb + ________ ft-lb

If your torque wrench has units of in-lb, what should the reading be if you need the following readings.

5. 2 ft-lb = __________ in-lb   6. 8 ft-lb = _________ in-lb

7. 2 1/2 ft-lb = ________ in-lb   8. 3 3/4 ft-lb = _______ in-lb

APPENDIX V

You have a set of wrenches that include every 1/16 inch up to and including one inch.

1. Tell what wrench is the next largest.

    a. 1/4 in   b. 11/16 in

    b. 1/2 in   d. 3/8 in

2. Tell what wrench is the next smallest.

    a. 9/16 in   b. 5/8 in

    c. 3/4 in   d. 1/2 in

3. Tell what wrench is the next largest.

    a. 1 cm   b. 19 mm   c. 9 mm

4. Tell what wrench is the next smallest.

    a. 15 mm   b. 11 mm   c. 9 mm

Clust Transportation

Occupation
Automotive
Guide Alignment and Brakes II #9728

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 433 of ____

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Area and Circumference	Discovery Math Algebra, Geometry, etc	Finding frictional area of brake shoes and Drums, disk pads. Areas of brake cylinder pistons. And the circumference of different tire sizes. (App I)		
Angle measurement	Discovery Math Geometry, Algebra, etc	Have an idea of what degrees are. Then use them in figuring camber, caster and king-pin degrees. (App II)		
+, - fractions and decimals	Discovery Math Senior Math	Working with shims, grinding brake drums, toe in and toe out. (App III)		

APPENDIX I

Example 1: A brake shoe is 2 in wide and a curved length of 6 in. What is the frictional area?

Example 2: A brake drum is 2 in wide and has a diameter of 1 foot. What is the frictional area?

Example 3: You have a 10 in disk brake and the disk pad is 2 inch wide. On the outer edge of the disk, the pad's length is 7.85 inch long and the inner edge is 4.71 inch long. What is the fictional surface of the pad?

Example 4: What is the circumference of a 14 inch tire?

Example 5: What is the surface area of a master cylinder that has the following diameters?

a. 1.35 cm b. 1 in c. 1 1/4 in d. 2.5 cm

APPENDIX II

Example 1: What is a degree?

Example 2: The following are what part of a circle?

a. 60° b. 45° c. 30°

d. 120° e. 10° f. 6°

Example 3: The camber of a tire is $+4^{\circ}$. You need a camber of -6°. a) How many degrees difference is this? b) What part of a circle is this?

Example 4: The caster is -2° and you need a caster of $+4^{\circ}$. a) How many degrees difference is this? b) What part of a circle is this?

Example 5: If the king-pin inclination is 4°, what part of a circle is this?

APPENDIX III

Example 1: You need a total of .027 inch of shims, but the largest you have is .015 inch. You have other sizes down to .005 inch by .001 inch sizes. What combinations of two shims could you use?

Example 2: You need a total of .104 inch of shims. You already have a shim .086 inch in. What size shim do you need?

Example 3: You want to grind a brake drum .010 inch. What would the setting be on the brake lathe?

Example 4: You set the brake lathe to grind off .010 inch. How much are you lengthening the diameter of the drum?

Example 5: You have a toe in of 1/16 inch. You need 1/4 inch toe in. How much do you have to change the toe in?

Example 6: You have a toe out of 3/16 inch, but you need a toe in of 3/8. How much of a change do you need?

Cluster Transportation

Occupation

Guide Automotive Body Repair I,III
#9733

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 437 of

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Ratio and Proportion	Discovery Math Algebra, Geometry Senior	Mix paints Appendix I		
Mult and div of fraction and decimals	Discovery Math Senior Math	Finding out how much paint is needed (App.I) Figuring out cost of labor. Appendix II		
Percents	Discovery Math Senior Math	Mark up on parts. Profit on a job. And to figure out with holdings from the pay check. Appendix II		

APPENDIX I

Example 1: To get a certain shade green you need to mix white to green in the ratio of one to two. How much paint of both white and green do you need to make a mixture of six gallons?

Example 2: What is the ratio of white to green if you use two gallons of white in a mixture of eight gallons?

Example 3: In a paint mixture, you use five parts red to eight parts mixture. How much red to you need to make four gallons of mixture?

Example 4: Paint covers 20 square feet per quart for each coat.

a) How much paint do you need for 70 square feet?

b) If you put on three coats, how much paint do you need?

APPENDIX II

Example 1: A repair job takes four hours and the hourly rate is $9.00 per hour. What is the labor bill?

Example 2: A repair job takes 3 1/2 hours of one employee at $8.00 an hour and 2 1/4 hours of another employee at $9.00 an hour. What is the labor bill?

Example 3: You have to order a part that costs you $120. What would you charge to get a 15% profit?

Example 4: Parts total $250 and your employee gets $5.50 an hour and it will take 12 hours to do the job. a) How much would you charge if you want 10% profit on parts and labor? b) How much would it be if you include sales tax?

Example 5: You earned $240 a week. Federal tax is $36.47, state tax is $16.23, and for social security you pay 5 1/2%. What is your take home pay?

Cluster Transportation

Occupation ________________

Guide Automotive Drive Train I #9730

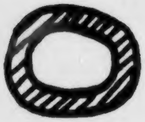
OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 440 of ____

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Area - , x fraction and decimals	Discovery Math, etc	Finding frictional surfaces of clutch disc (App. I)		
+ decimals	Discovery Math, etc	Finding combinations of shims. (App. I)		
Ratio and proportion	Discovery Math, etc	Mesh gear ratio and combinations (transmissions and differentials) (App. II). Mechanical advantages of clutch linkage (App. II)		
Measurement of angles thru changing the length of the sides of a △	Geometry, Higher Alg. Senior Analysis	Finding the angle of the transmission and the drive shaft. (App. III)		
Percent	Discovery Math Senior Math	Percentage of change in strength in changing width of gears. (App. III)		
Conversions of units	Discovery Math, etc	Torque - changing ft-lb to in-lb and back (App. IV)		
Comparison of fractions	Discovery Math Senior Math	Be able to find the next largest or smallest wrench. (App. V)		
Use of rulers and micrometer	Discovery Math	Using rulers and micrometers to measure various parts of an engine. (App. VI)		

APPENDIX I



Find the surface area of the following clutch disc.

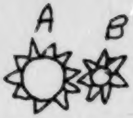
1. Disc diameter nine inch, ring two inch wide.
2. Disc diameter nine inch, ring 1 1/2 inch wide.
3. Disc diameter ten inch, ring 1 1/2 inch wide.
4. Disc diameter ten inch, ring two inch wide.
5. Disc diameter 11 inch, ring two inch wide.
6. Disc diameter 11 inch, ring 1 1/2 inch wide.

You have the following shim sizes .001, .002, .005, .006, .007, .009, .010, .012, .015, .019, .023 inch.

What combination could you use to obtain the following total thickness (no more than three shims at once)?

7. .011 inch - __________, __________, __________, __________, __________
   __________, __________, __________
8. .027 inch - __________, __________, __________, __________, __________
9. .018 inch - __________, __________, __________, __________, __________
10. .008 inch - __________, __________, __________, __________, __________

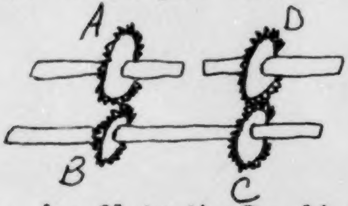
APPENDIX II



What is the mesh gear ratio, A to B, of the following?

1. A = 20 teeth, B = 12 teeth
2. A = 32 teeth, B = 14 teeth
3. A = 36 teeth, B = 15 teeth
4. B = 21 teeth, A = 28 teeth
5. If A is turned in a clock wise direction, what direction is B turned?

What is the gear ratio of the following combinations (---- to 1)?

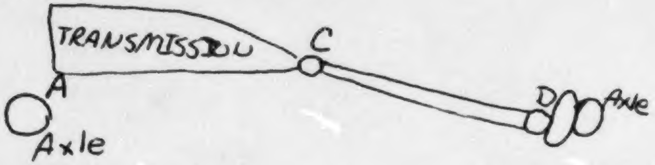


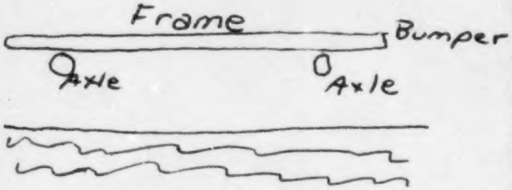
6. A = 31 teeth, B = 14 teeth, C = 27 teeth, D = 18 teeth
7. A = 31 teeth, B = 14 teeth, C = 20 teeth, D = 25 teeth
8. A = 31 teeth, B = 14 teeth, C = 27 teeth, D = 14 teeth
9. A = 31 teeth, B = 14 teeth, C = 14 teeth, D = 31 teeth

What is the gear ratio of the differential if the gears have the following number of teeth (---- to 1)?

10. 48 teeth to 12 teeth
11. 36 teeth to 10 teeth
12. 34 teeth to 8 teeth
13. 42 teeth to 11 teeth

APPENDIX III





CD makes an angle of 15° with the horizontal. The transmission moves with the frame and starts out in a horizontal position. The back bumper is 16 inches above the ground, you then raise the back bumper to 20 inches. The wheel base is 120 inches. The back bumper is 48 inches from the rear axle.

1. What is the angle the frame makes with the horizontal?

2. What would the caster become if it was at 4° before the bumper was raised?

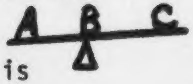
3. What is the new angle of CD with the horizontal?

4. What is the measure of ∠ACD?

5. If a gear 1/2 inches wide has a certain strength, what would be the percent of increase in strength if the gear was increased to 3/4 inches wide? What would be the percent of decrease in strength if the gear was decreased to 3/8 inches wide?

Appendix III (Continued)

6. What is the mechanical advantage if AB is 4 inches and BC is 2 inches?



7. What is the mechanical advantage if AB is 3 1/2 inches and BC is 1 1/2 inches?

APPENDIX IV

If your torque wrench has units of ft-lb, what should the reading be if you need the following readings.

1. 18 in-lb = ________ft-lb
2. 9 in-lb = ________ft-lb
3. 21 in-lb = ________ft-lb
4. 100 in-lb = ________ft-lb

If your torque wrench has units of in-lb what should the reading be if you need the following readings.

5. 2 ft-lb = ________in-lb
6. 8 ft-lb = ________in-lb
7. 2 1/2 ft-lb = ________in-lb
8. 3 3/4 ft-lb = ________in-lb

APPENDIX V

You have a set of wrenches that include every 1/16 inch up to and including one inch.

Example 1: Tell what wrench is the next largest.

a. 1/4 in   b. 11/16 in
c. 1/2 in   d. 3/8 in

Example 2: Tell what wrench is the next smallest.

a. 9/16 in   b. 5/8 in
c. 3/4 in   d. 1/2 in

You have a set of wrenches that include every millimeter from 5 mm to 2 cm.

Example 3: Tell what wrench is the next largest.

a. 1 cm   b. 19 mm   c. 9 mm

Example 4: Tell what wrench is the next smallest.

a. 15 mm   b. 11 mm   c. 9 mm

APPENDIX VI

Get a variety of objects and measure them with a micrometer. Examples: finger, chair leg, thickness of books, metal rods, shafts of metal, etc.

Use the same objects above or obtain others and measure them with a ruler.

Cluster Transportation

Occupation

Guide Automotive Engines I #9742

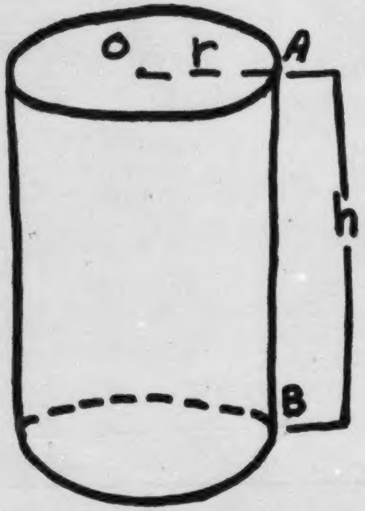
OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 448 of

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Volume fraction to decimal Mult. decimals add and subt. decimals	Discovery Math Algebra Geometry	Finding volume of cylinders. Manuals give cylinder size in fractions. Find the difference in volume after reboring and restroking. (Appendix I)		
Ratios and proportions	Discovery Math Algebra Geometry Senior Math	Finding compression ratios of cylinders (Appendix I)		
Add, Subt, Mult, div of decimals	Discovery Math Senior Math and all others	Finding horsepower of engines and after reboring and restroking. (Appendix II)	Physics	
Conversion of metric and Eng	Discovery Math Senior Math and all others	Convert cubic inches to cubic centimeters and back. (Appendix III)		
Conversion of units	Discovery Math, etc	Torque - changing ft-lb to in-lb and back (Appendix IV)		
Comparison of fractions	Discovery Math Senior Math	Be able to find the next largest or smallest wrench. (Appendix V)		
Angle size	Discovery Math Geometry	Be able tell the angle on valves. (App VI)		
Add and subt fractions, decimals	Discovery Math Senior Math	Finding the out of round and taper. (App VII)		

APPENDIX I



Example 1: Change the following to decimals.

a. 1/2 b. 1/4 c. 3/8

Example 2: Find the volume of a cylinder. The radius, OA, is 2 1/4 inch. The height, AB, is 3 1/2 inch. Use 3.14 for π. The volume of a cylinder is found by the following formula. $V = \pi r^2 h$

Example 3: Find the cubic inch displacement of a six cylinder engine, if each cylinder has the measurements of the cylinder in problem 2.

A cylinder has a radius of two inches and stroke of three inches.

Example 4: What is the cylinders volume?

Example 5: What would the volume be if it was rebored .030 inch?

Example 6: What is the difference in volumes of problem four and five?

Example 7: If the cylinder is restroked to 3 1/2 inch, what is the new volume?

Example 8: If the combustion chamber has a volume of five cubic inches, what is the compression ratio?

Example 9: What would the combustion ratio be of the cylinder in problem five if the combustion chamber has a volume of five cubic in.?

Example 10: What would the combustion ratio be of the cylinder in problem 7 if the combustion chamber has a volume of five cubic inches?

APPENDIX II

An engine has six cylinders. Each cylinder has a diameter of two inches and a stroke of three inches. For the following problems, consider the rpm to be 3000.

$$hp = \frac{DxNxSxRPM}{11,000}$$

Example 1: What is the horsepower?

Example 2: What would be the horsepower if the cylinders were rebored .060 inch?

Example 3: What would be the horsepower if the cylinders were restroked to 3.5 inch?

Example 4: What would be the horsepower if the engine was both rebored and restroked as in problems two and three?

APPENDIX III

1 inch = 2.5 centimeters

Example 1: Change following metric units to inches.

a. 9mm = _______in.　　b. 10 cm = _______in.

c. 4.8 cm = _______in.　　d. 12 mm = _______in.

Example 2: Change following units to metric units.

a. 2.5 in = _______cm　　b. 1 in = _______cm

c. 1/2 in = _______cm　　d. 1/16 = _______cm

Example 3: 1 cubic inch = _________ cubic centimeters (cc)

Example 4: Change the following cubic units to cubic inches.

a. 1500 cc = _____________cu in

b. 600 cc = ______________cu in

c. 500 cc = ______________cu in

Example 5: Change the following cubic inches to cubic centimeters.

a. 250 cu in = _________cc

b. 200 cu in = _________cc

c. 66 cu in = _________cc

APPENDIX IV

If your torque wrench has units of ft-lb, what should the reading be if you need the following readings.

1. 18 in-lb = _________ft-lb
2. 9 in-lb = _________ft-lb
3. 21 in-lb = _________ft-lb
4. 100 in-lb = _________ft-lb

If your torque wrench has units of in-lb what should the reading be if you need the following readings.

5. 2 ft-lb = _________in-lb
6. 8 ft-lb = _________in-lb
7. 2 1/2 ft-lb = _________in-lb
8. 3 3/4 ft-lb = _________in-lb

APPENDIX V

You have a set of wrenches that include every 1/16 inch up to and including one inch.

Example 1: Tell what wrench is the next largest.

a. 1/4 in   b. 11/16 in
c. 1/2 in   d. 3/8 in

Example 2: Tell what wrench is the next smallest.

a. 9/16 in   b. 5/8 in
c. 3/4 in   d. 1/2 in

You have a set of wrenches that include every millimeter from 5 mm to 2 cm.

Example 3: Tell what wrench is the next largest.

a. 1 cm   b. 19 mm   c. 9 mm

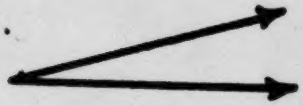
Example 4: Tell what wrench is the next smallest.

a. 15 mm   b. 11 mm   c. 9 mm

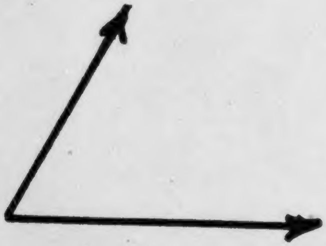
APPENDIX VI

Tell which of the following have the measurement of 15°, 30°, 45°, 60°, or 90°.

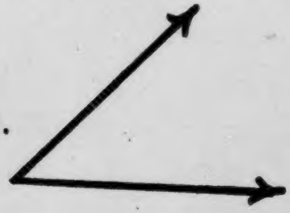
1.



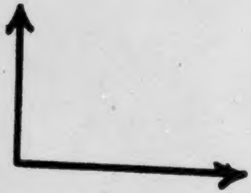
2.



3.



4.



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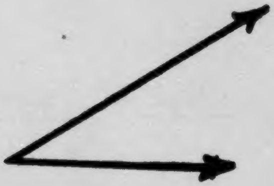
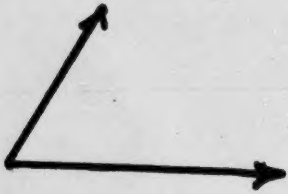


6.



Draw an angle of the following measurement.

7. 60°

8. 90°

10. 15°

11. 30°

12. 45°

APPENDIX VII

How much out of round is a shaft if you have the following measurements?

1. .997, .998, and .994 cm
2. .457, .452, and .449 in
3. .678, .680, and .683 in
4. .892, .888, and .884 cm

What is the taper if the width of a shaft at its ends are the following.

5. 1 7/8 in and 1 13/16 in
6. .89 in and .93 in
7. 1 1/4 in and 7/8 in
8. 2.4 cm and 2.37 cm
9. 1.52 in and 1.4 in
10. 2 1/8 in and 1 15/16 in

Cluster Transportation

Occupation

Guide Automotive Systems III #9726

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

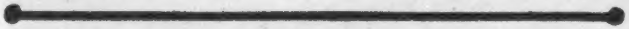
MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 457 of

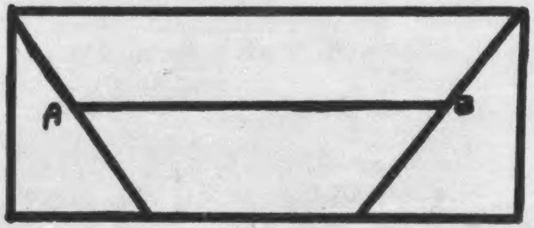
Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Measure lengths	Basic Skills	Measure vehicle suspension height - Concept used by auto mechanics - See Appendix 1		
Add and subtract fractions	Basic Skills, Sr. Math	Compare vehicle suspension height with manufacturers specifications - Concept used by auto mechanics - See Appendix 2		
Read a number scale	Basic Skills	Use a tread depth gauge - Concept used by auto mechanics - See Appendix 3 Also - use a tire pressure gauge - use a drum micrometer		

Appendix 1

Example 1: Measure the length of this segment to the nearest 1/8":



Example 2: Measure the length of segment AB to the nearest 1/8":



Appendix 2

Example 1: Subtract: 12 1/8 - 10 7/8

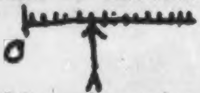
Example 2: Add: 2 1/4 + 7 5/8

Example 3: If one side of a control arm is 9 5/8 inches from the ground; and the other side is 12 1/8 inches from the ground, what is their difference?

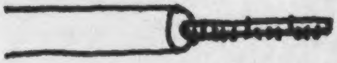
Example 4: The difference between two measurements is supposed to be 3 5/16. ± 1/4" of error is allowed. If the two measurement are 8 3/8" and 12", are the measurements within an acceptabel range?

Appendix 3

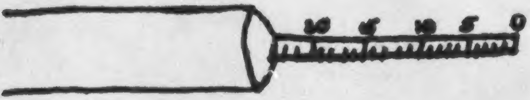
Example 1: If each mark on this line is 1/64", what measurement is associated with point A?



Example 2: If each mark on this gauge is 1/64", what reading does the gauge show? (The end of the extended portion is 0)



Example 3: How many pounds of pressure is shown by this gauge?



Cluster Transportation

Occupation

Guide Automotive Tune-up I #9729

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 461 of

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Mult, div decimals	Discovery Math Senior Math, etc	Using Ohm's Law (App I)	Physics	
Percent	Discovery Math, etc	Percentage of variation between cylinders (App I)		
Ratio	Discovery Math, etc	Transformers ratios (App I)		
Volume fraction to decimal x, +, - decimals	Discovery Math Algebra, Geometry	Finding volume of cylinders. Manuals give cylinder size in fractions. Finding the difference in volume after reboring and restroking (App II)		
Conversions of units	Discovery Math, etc	Torque - changing ft-lb to in-lb and back (App III)		
+, - decimals	Discovery Math, etc	The use of a feeler gauge. (App III)		
Reading ruler	Discovery Math, etc	Reading a ruler marked off in 1/32 of inch for float adjustment. (App III)		
Comparison of fractions	Discovery Math Senior Math	Be able to find the next largest or smallest wrench. (App IV)		
Angle size	Discovery Math Geometry	Determine degrees of dwell and advance (App V)		

APPENDIX I

Ohm's law is amperes equals volts divided by ohms. $I = \frac{E}{R}$

What is the measurement of the resistance (Ohms)?

1. I = .2 amperes, E = 6 volts   2. I = .03 amperes, E = 12 volts

What is the measurement of electrical pressure (volts)?

3. I = 3 amperes, R = 4 ohms   4. I = .05 amperes, R = 120 ohms

What is the measurement of amperes?

5. E = 12 volts, R = 16 ohms   6. E = 6 volts, R = 4 ohms

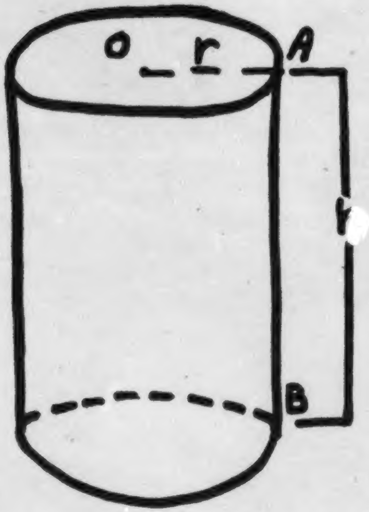
7. What is the percentage of variation between the following cylinder compression? 140, 125, 115, 110, 110, 100

8. What is the ratio of the transformers with the following number of turns?

   a. 20,000 turns to 200 turns   b. 18,000 turns to 180 turns

   c. 18,000 turns to 150 turns

APPENDIX II



Example 1: Change the following to decimals.

a. 1/2 b. 1/4 c. 3/8

Example 2: Find the volume of a cylinder. The radius, OA, is 2 1/4 inch. The height, AB, is 3 1/2 inch. Use 3.14 for π. The volume of a cylinder is found by the following formula. $V = \pi r^2 h$

Example 3: Find the cubic inch displacement of a six cylinder engine, if each cylinder has the measurements of the cylinder in problem 2.

A cylinder has a radius of two inches and stroke of three inches.

Example 4: What is the cylinders volume?

Example 5: What would the volume be if it was rebored .030 inch?

Example 6: What is the difference in volumes of problem four and five?

Example 7: If the cylinder is restroked to 3 1/2 inch, what is the new volume?

Appendix II (Continued)

Example 8: If the combustion chamber has a volume of five cubic inches, what is the compression ratio?

Example 9: What would the combustion ratio be of the cylinder in problem five if the combustion chamber has a volume of five cubic in.?

Example 10: What would the combustion ratio be of the cylinder in problem 7 if the combustion chamber has a volume of five cubic inches?

APPENDIX III

If your torque wrench has units of ft-lb, what should the reading be if you need the following readings.

1. 18 in-lb = __________ft-lb   2. 9 in-lb = __________ft-lb

3. 21 in-lb = __________ft-lb   4. 100 in-lb = __________ft-lb

If your torque wrench has units of in-lb what should the reading be if you need the following readings.

5. 2 ft-lb = __________in-lb   6. 8 ft-lb = __________in-lb

7. 2 1/2 ft-lb = __________in-lb   8. 3 3/4 ft-lb = __________in-lb

9. A feeler gauge has the following measurements, .002, .003, .005, .007, .011, .013, .014, .015, .017, .019, .020, .023, .024, .025, .026, .028, .030, .031, .032, and .036 inch.

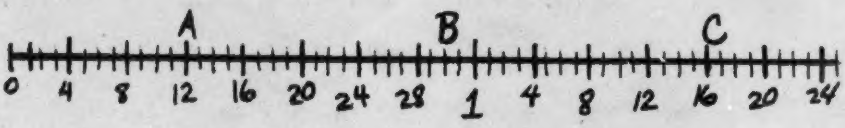
What combinations can you make (not using more than two) to get the following measurements?

a. .014 inch __________,__________   b. .017 inch _____,_____,_____

c. .034 inch ________,________,________,________,________,________

d. .032 inch ________,________,________,________,________,________ Appendix III(Continued)

10. Tell the reading of the following labeled points.



A = ________ B = ________ C = ________

APPENDIX IV

You have a set of wrenches that include every 1/16 inch up to and including one inch.

Example 1: Tell what wrench is the next largest.

a. 1/4 in b. 11/16 in

c. 1/2 in d. 3/8 in

Example 2: Tell what wrench is the next smallest.

a. 9/16 in b. 5/8 in

c. 3/4 in d. 1/2 in

You have a set of wrenches that include every millimeter from 5 mm to 2 cm.

Example 3: Tell what wrench is the next largest.

a. 1 cm b. 19 mm c. 9 mm

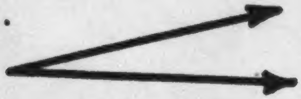
Example 4: Tell what wrench is the next smallest.

a. 15 mm b. 11 mm c. 9 mm

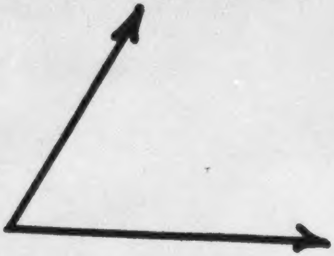
APPENDIX V

Tell which of the following have the measurement of 15°, 30°, 45°, 60°, or 90°.

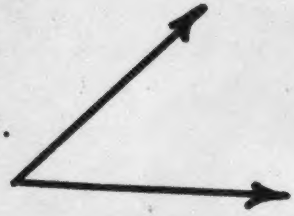
1.



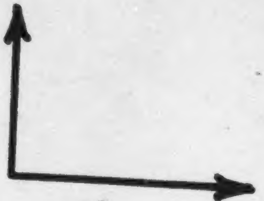
2.



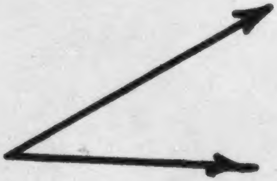
3.



4.



5.



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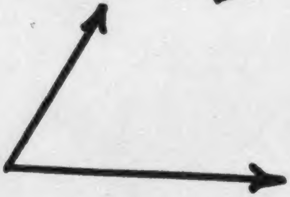

Draw an angle of the following measurement.

7. 60°

8. 90°

10. 15°

11. 30°

12. 45°

Cluster Transportation

Occupation

Guide Marine Engine Repair #9740

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 469 of

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Mult., div. decimals	Discovery Math Senior Math, etc	Using Ohm's Law (App I)	Physics	
+, - decimals	Discovery Math, etc	Changes in valve lift (App II)		
Ratio and proportion	Discovery Math Algebra, Geometry,etc	Gear ratio, fuel mixture, compression ratio (App II,III)		
Volume Fraction to decimal Mult, +, - decimal	Discovery Math Algebra, Geometry	Finding volume of cylinders. Manuals give cylinder size in fractions. Finding the difference in volume after reboring and restroking. (App III)		
Comparison of fractions	Discovery Math Senior Math	Be able to find the next largest or smallest wrench. (App IV)		

APPENDIX I

Ohm's Law is amperes equals volts divided by ohms. $I = \frac{E}{R}$

What is the measurement of the resistance (Ohms)?

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2. I = .03 amperes, E = 12 volts

What is the measurement of electrical pressure (volts)?

3. I = 3 amperes, R = 4 ohms
4. I = .05 amperes, R = 120 ohms

What is the measurement of amperes?

5. E = 12 volts, R = 16 ohms
6. E = 6 volts- R = 4 ohms

APPENDIX II

Example 1: You have a valve lift of .350 inch and you changed the valve so that it was .013 longer. What would the new lift be?

Example 2: You have a valve lift of .300 inch and you changed the valve so that it was .01 inch shorter. What would the new valve lift be?

Example 3: What is the gear ratio of the following?

a. 24 teeth to 8 teeth   b. 16 teeth of 4 teeth

c. 60 teeth to 12 teeth   d. 34 teeth to 14 teeth

Example 4: The outboard motor needs a fuel mixture (gas to oil) of 4 to 1. How much oil will you need?

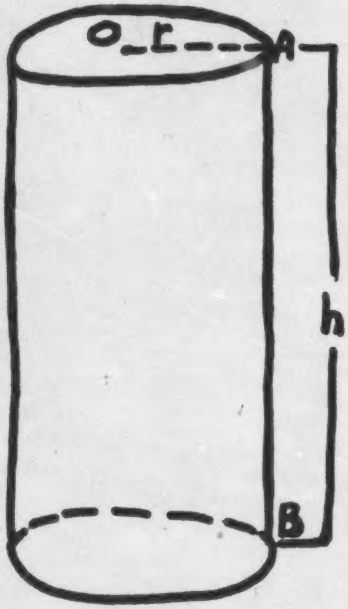
a. If you want a 10 gallon mixture.

b. If you have 2 gallons of gas.

c. If you have 7 gallons of gas.

d. If you want an 8 gallon mixture.

APPENDIX III



Example 1: Change the following to decimals.

a. 1/2 b. 1/4 c. 3/8

Example 2: Find the volume of a cylinder. The radius is 1 1/4 inch. The height is 2 1/2 inch. Use 3.14 for . The volume of a cylinder is found by the following formula. $V = r^2h$

Example 3: Find the cubic inch displacement of a 2 cylinder engine, if each cylinder has the displacement of the cylinder in problem 2.

A cylinder has a radius of two inches and a stroke of three inches.

Example 4: What is the cylinder volume?

Example 5: What would the volume be if it was rebored .030 inch?

Example 6: What is the difference in volumes of problem 4 and 5?

Example 7: If the cylinder is restroked to 3 1/2 inches, what is the new volume?

Appendix III (Continued)

Example 8: If the combustion chamber has a volume of 4 cubic inches, what is the compression ratio?

Example 9: What would the combustion ratio be of the cvlinder in problem 5 if the combustion chamber has a volume of 4 cubic inches?

Example 10: What would the combustion ratio be of the cylinder in problem 7 if the combustion chamber has a volume of 4 cubic in.

APPENDIX IV

You have a set of wrenches that include every 1/16 inch up to and including 1 inch.

Example 1: Tell what wrench is the next largest.

a. 1/4 in b. 11/16 in

c. 1/2 in d. 3/8 in

Example 2: Tell what wrench is the next smallest.

a. 9/16 in b. 5/8 in

c. 3/4 in d. 1/2 in

You have a set of wrenches that include every millimeter from 5 mm to 2 cm.

Example 3: Tell what wrench is the next largest.

a. 1 cm b. 19 mm c. 9 mm

Example 4: Tell what wrench is the next smallest.

a. 15 mm b. 11 mm c. 9 mm

Cluster Transportation

Occupation ________________

Guide Recreational Vehicle Repair I

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 475 of ____

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Mult., div. decimals	Discovery Math Senior Math, etc	Using Ohm's Law (App I)	Physics	
Ratios and Proportions	Discovery Math Algebra, Geometry Senior Math	Gear ratio of mesh gears and chain and sprocket (App II)		
+, - decimals	Discovery Math, etc	The use of a feeler gauge		
Conversion of Eng to metric and back	Discovery Math, etc	Be able to change one measurement to another, for comparisons and using manuals. (App III)		
+, - fractions and decimals	Discovery Math, etc	To take two measurements and be able to find the sum or difference. (App III)		
Area	Discovery Math, etc	Find the area of snowmobile tracks, torque surface of roller chain, and frictional area of Vee belts. (App IV)		
+, -, x, ÷ of decimals	Discovery Math Senior Math, etc	Finding horsepower of engines and after reboring and restroking (App V)		
Angle size	Discovery Math Geometry	Be able to tell the angle on valves. (App VI)		

APPENDIX I

Ohm's law is amperes equals volts divided by ohms. $I = \frac{E}{R}$

What is the measurement of the resistance (Ohms)?

1. I = .2 amperes, E = 6 volts
2. I = .03 amperes, E = 12 volts

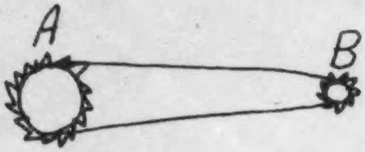
What is the measurement of electrical pressure (volts)?

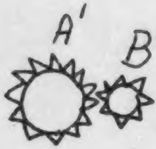
3. I = 3 amperes, R = 4 ohms
4. I = .05 amperes, R = 120 ohms

What is the measurement of amperes?

5. E = 12 volts, R = 16 ohms
6. E = 6 volts, R = 4 ohms

APPENDIX II





1. What is the meash gear ratio, A' to B', of the following?

a. A' = 24 teeth, B' = 8 teeth b. A' = 60 teeth, B' = 12 teeth

c. A' = 34 teeth, B' = 14 teeth d. A' = 28 teeth, B' = 21 teeth

2. What is the chain and sprocket gear ratio, A to B, of the following?

a. A = 42 teeth, B = 24 teeth b. B=21 teeth, A = 35 teeth

c. A = 39 teeth, B = 26 teeth d. A = 51 teeth, B = 34 teeth

3. A feeler gauge has the following measurements. .002, .003, .005, .007, .011, .013, .014, .015, .017, .019, .020, .023, .024, .025, .026, .028, .030, .031, .032, and .036 inch.

What combinations can you make (not using more than two) to get the following measurements?

a. .014 - __________,__________ b. .017 inch _____,_____,_____

c. .034 inch - ________,________,________,________,________,________

d. .032 inch - __________,__________,__________,__________,__________

APPENDIX III

Change the following to the indicated units.

1. 1 cm = __________mm
2. 1 inch = __________cm
3. 46 mm = __________cm
4. 254 mm = __________inch
5. 6 inch = __________cm
6. 7 inch = __________mm
7. 63.5 cm = __________inch
8. 3.65 cm = __________mm
9. 76.2 mm = __________inch
10. 1 foot = __________cm

If you got the following reading, what are the sums and differences?

11. 2 1/8 inch and 1 3/4 inch
12. 6.2 cm and 4 cm
13. 25 mm and 2.3 cm
14. 11/16 inch and 1 1/2 inch

What is the product?

15. 2 1/4 inch and 1 1/2 inch

16 2 cm and 12 mm

Find the area of a snowmobile track that makes contact with the snow with the following dimension.

1. 3' x 15''
2. 3 1/2 ' x 18''
3. 4' x 15''
4. 5' x 18''

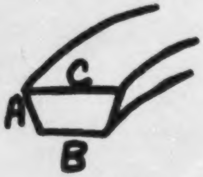
Find the torque surface of the following roller chain (1/4 of surface of each roller).

5. 10 rollers are in contact with the gear. Each roller is 1/2 inch in diameter and 1 inch long.

6. 20 rollers are in contact with the gear. Each roller is 1/4 in. in diameter and 3/8 inch long.

Find the frictional area of the following area of the following Vee belts.

7. Makes contact with 1/2 of a 6 inch pulley.
   A = 1/2 inch, B = 1/4 inch, C = 3/8 inch



8. Makes contact with 1/2 of a 6 inch pulley. A = 1/2 inch, B = 3/8 inch, C = 1/2 inch.

9. Makes contact with 1/3 of a 4 inch pulley. A = 1/2 inch, B = 3/8 inch, C = 5/8 inch.

APPENDIX V

An engine has six cylinders. Each cylinder has a diameter of two inches and a stroke of three inches. For the following problems, consider the rpm to be 3000.

$$hp = \frac{DxNxSxRPM}{11,000}$$

Example 1: What is the horsepower?

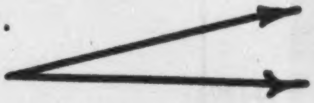
Example 2: What would be the horsepower if the cylinders were rebored .060 inch?

Example 3: What would be the horsepower if the cylinders were restroked to 3.5 inch?

Example 4: What would be the horsepower if the engine was both rebored and restroked as in problems two and three?

Tell which of the following have the measurement of 15°, 30°, 45°, 60°, or 90°.

1.



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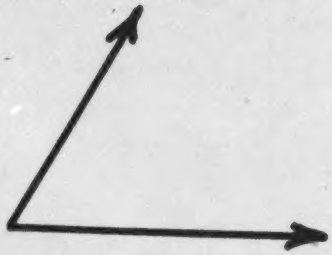

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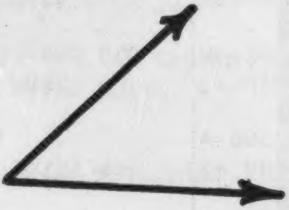

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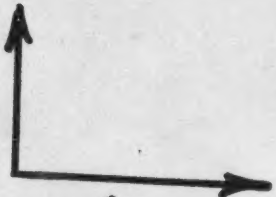

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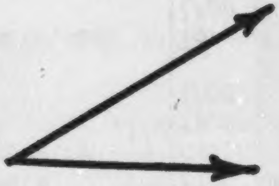

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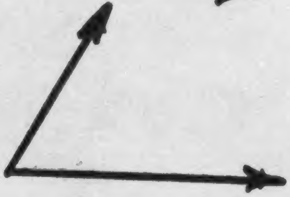


Draw an angle of the following measurement.

7. 60°

8. 90°

10. 15°

11. 30°

12. 45°

Cluster Transportation

Occupation ____

Guide Small Engine Repair I #9736

OCCUPATIONAL EDUCATION
INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE
FOR RELATED CONCEPTS

Sht 482 of ____

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Mult., div, decimals	Discovery Math Senior Math, etc	Using Ohm's Law (App I)	Physics	
+, - decimal	Discovery Math, etc	Changes in valve lift (App II)		
Ratio and proportion	Discovery Math Algebra, Geometry, etc	Gear ratio, fuel mixture, compression ratio (App II,III)		
Volume Fraction to decimal Mult, +, -, decimal	Discovery Math Algebra, Geometry	Finding volume of cylinders. Manuals give cylinder size in fractions. Finding the difference in volume after reboring and restroking. (App III)		
Conversion of units	Discovery Math, etc	Torque - changing ft-lb to in-lb and back. (App IV)		
Comparison of fractions	Discovery Math, etc	Be able to find the next largest or smallest wrench. (App V)		
Add, subt, mult, div of decimals	Discovery Math Senior Math and etc.	Finding horsepower of engines and after reboring and restroking. (App VI)	Physics	
Use of rulers and micrometer	Discovery Math	Using rulers and micrometers to measure various parts of an engine. (App VII)		

APPENDIX I

Ohm's law is amperes equals volts divided by ohms. $I = \frac{E}{R}$.

What is the measurement of the resistance (Ohms)?

1. I = .2 amperes, E = 6 volts
2. I = .03 amperes, E = 12 volts

What is the measurement of electrical pressure (volts)?

3. I = 3 amperes, R = 4 ohms
4. I = .05 amperes, R = 120 ohms

What is the measurement of amperes?

5. E = 12 volts, R = 16 ohms
6. E = 6 volts, R = 4 ohms

APPENDIX II

Example 1: You have a valve lift of .350 inch and you changed the valve so that it was .013 longer. What would the new lift be?

Example 2: You have a valve lift of .300 inch and you changed the valve so that it was .01 inch shorter. What would the new valve lift be?

Example 3: What is the gear ratio of the following?

a. 24 teeth to 8 teeth b. 16 teeth to 4 teeth

c. 60 teeth to 12 teeth d. 34 teeth to 14 teeth

Example 4: The outboard motor needs a fuel mixture (gas to oil) of 4 to 1. How much oil will you need?

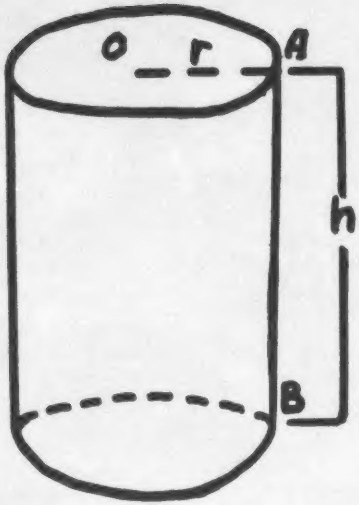
a. If you want a 10 gallon mixture.

b. If you have 2 gallons of gas.

c. If you have 7 gallons of gas.

d. If you want an 8 gallon mixture.

APPENDIX III



Example 1: Change the following to decimals.

a. 1/2   b. 1/4   c. 3/8

Example 2: Find the volume of a cylinder. The radius, OA, is 2 1/4 inch. The height, AB, is 3 1/2 inch. Use 3.14 for π. The volume of a cylinder is found by the following formula.

$V = \pi r^2 h$

Example 3: Find the cubic inch displacement of a six cylinder engine, if each cylinder has the measurements of the cylinder in problem 2.

A cylinder has a radius of two inches and stroke of three inches.

Example 4: What is the cylinders volume?

Example 5: What would the volume be if it was rebored .030 inch?

Example 6: What is the difference in volumes of problem four and five?

Example 7: If the cylinder is restroked to 3 1/2 inch, what is the new volume?

Appendix III (Continued)

Example 8: If the combustion chamber has a volume of five cubic inches, what is the compression ratio?

Example 9: What would the combustion ratio be of the cylinder in problem five if the combustion chamber has a volume of five cubic in.?

Example 10: What would the combustion ratio be of the cylinder in problem 7 if the combustion chamber has a volume of five cubic inches?

APPENDIX IV

If your torque wrench has units of ft-lb, what should the reading be if you need the following readings.

1. 18 in-lb = _________ft-lb
2. 9 in-lb = _________ft-lb
3. 21 in-lb = _________ft-lb
4. 100 in-lb = _________ft-lb

If your torque wrench has units of in-lb what should the reading be if you need the following readings.

5. 2 ft-lb = _________in-lb
6. 8 ft-lb = _________in-lb
7. 2 1/2 ft-lb = _________in-lb
8. 3 3/4 ft-lb = _________in-lb

APPENDIX V

You have a set of wrenches that include every 1/16 inch up to and including one inch.

Example 1: Tell what wrench is the next largest.

a. 1/4 in
b. 11/16 in
c. 1/2 in
d. 3/8 in

Example 2: Tell what wrench is the next smallest.

a. 9/16 in
b. 5/8 in
c. 3/4 in
d. 1/2 in

You have a set of wrenches that include every millimeter from 5 mm to 2 cm.

Example 3: Tell what wrench is the next largest.

a. 1 cm
b. 19 mm
c. 9 mm

Example 4: Tell what wrench is the next smallest.

a. 15 mm
b. 11 mm
c. 9 mm

APPENDIX VI

An engine has six cylinders. Each cylinder has a diameter of two inches and a stroke of three inches. For the following problems, consider the rpm to be 3000.

$$hp = \frac{DxNxSxRPM}{11{,}000}$$

Example 1: What is the horsepower?

Example 2: What would be the horsepower if the cylinders were rebored .060 inch?

Example 3: What would be the horsepower if the cylinders were restroked to 3.5 inch?

Example 4: What would be the horsepower if the engine was both rebored and restroked as in problems two and three?

APPENDIX VII

Get a variety of objects and measure them with a micrometer. Examples: finger, chair leg, thickness of books, metal rods, shafts of metal, etc.

Use the same objects above or obtain others and measure them with a ruler.

Cluster Transportation

Occupation

Guide Small Engine Repair II #9737

OCCUPATIONAL EDUCATION INTERRELATED CURRICULUM PROJECT

MATHEMATICS SUPPLEMENTAL GUIDE FOR RELATED CONCEPTS

Sht 491 of

Math Concept Taught	Course Number and Math Course Taught In	Occupational Application of Concept	Other Area of Application	Notes
Volume and area	Discovery Math, etc	Finding volume of cylinders. Finding the difference in volume after reboring and restroking. (App III) Area of bearing a frictional surfaces (App I)		
Ratio and proportion	Discovery Math Algebra, geometry, etc	Gear ratio, fuel mixture, compression ratio (App II, III)		
Conversion of units	Discovery Math, Etc	Torque - changing ft-lb to in-lb and back (App IV)		
Angle size	Discovery Math Geometry	Be able to tell the angle on valves (App V)		
Use of rulers and micrometer	Discovery Math	Using rulers and micrometers to measure various parts of an engine. (App VI)		

APPENDIX I

Example 1: What is the surface area of a bearing in the shape of a sphere? Whose diameter is .8 inch.

Example 2: What is the surface area of a bearing in the shape of a sphere? Whose diameter is 2 cm.

Example 3: A bearing is in the shape of a cylinder. What is the surface area of its lateral surface, if the diameter is 3 inches and height is .5 inch?

Example 4: A bearing is in the shape of a cylinder. What is the surface area of its lateral surface, if the diameter is 2.4 cm and the height is .8 cm?

Example 5: A cylinder is 3 inches in diameter and the piston is 2 inches high. What is the surface (lateral) area of the piston?

Example 6: A cylinder is 3.6 cm in diameter and the piston is 1.5 cm high. What is the surface (lateral) area of the piston?

APPENDIX II

Example 1: You have a valve lift of .340 inch and you changed the valve so that it was .013 longer. What would the new lift be?

Example 2. You have a valve lift of .300 inch and you changed the valve so that it was .01 inch shorter. What would the new valve lift be?

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a. 24 teeth to 3 teeth b. 16 teeth to 4 teeth

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Example 4: The outboard motor needs a fuel mixture (gas to oil) of 4 to 1. How much oil will you need?

a. If you want a 10 gallon mixture.

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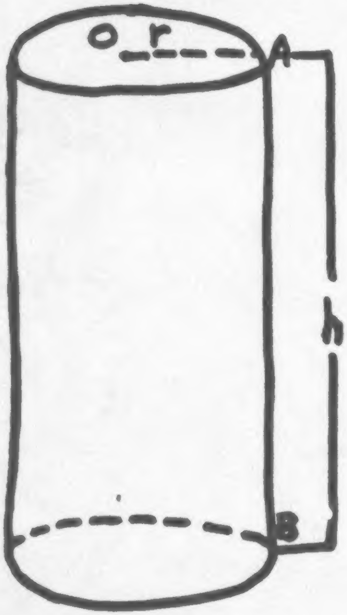
c. If you have 7 gallons of gas.

d. If you want an 8 gallon mixture.

APPENDIX III



Example 1: Change the following the decimals.

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Example 2: Find the volume of a cylinder. The radius is 1 1/4 inch. The height is 2 1/2 inch. Use 3/14 for π. The volume of a cylinder is found by the following formula. $V = \pi r^2 h$.

Example 3: Find the cubic inch displacement of a 2 cylinder engine, if each cylinder has the displacement of the cylinder in problem 2.

A cylinder has a radius of 2 inches and a stroke of 3 inches.

Example 4: What is the cylinder volume?

Example 5: What would the volume be if it was rebored .030 inch?

Example 6. What is the difference in volumes of problem 4 and 5?

Example 7: If the cylinder is restroked in 3 1/2 inch, what is the new volume?

APPENDIX III (Continued)

Example 8: If the combustion chamber has a volume of 4 cubic inches, what is the compression ratio?

Example 9: What would the combustion ratio be of the cylinder in problem 5 if the combustion chamber has a volume of 4 cubic inches?

Example 10: What would the combustion ratio be of the cylinder in problem 7 if the combustion chamber has a volume of 4 cubic in?

APPENDIX IV

If your torque wrench has units of ft-lb, what should the reading be if you need the following reading.

1. 18 in-lb = _________ft-lb   2. 9 in-lb = _________ft-lb

3. 21 in-lb = _________ft-lb   4. 100 in-lb = _________ft-lb

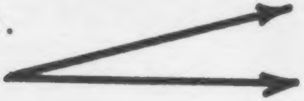
If your torque wrench has units of in-lb what should the reading be if you need the following readings.

5. 2 ft-lb = _________in-lb   6. 8 ft-lb = _________in-lb

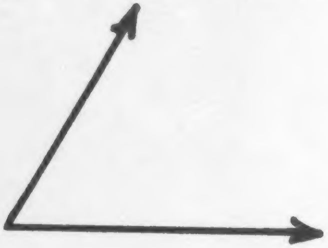
7. 2 1/2 ft-lb = _________in-lb   8. 3 3/4 ft-lb = _________in-lb

Tell which of the following have the measurement of 15°, 30°, 45°, 60°, or 90°.

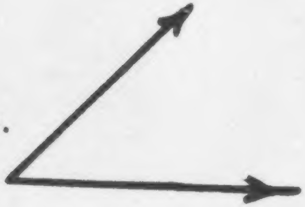
1.



2.



3.



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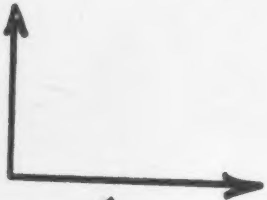
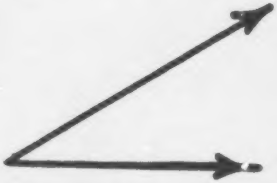
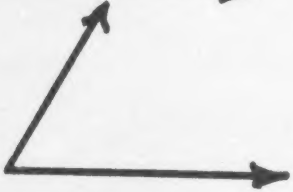


5.



6.



Draw an angle of the following measurement.

7. 60°

8. 90°

10. 15°

11. 30°

12. 45°

APPENDIX VI

Get a variety of objects and measure them with a micrometer. Examples: finger, chair leg, thickness of books, metal rods, shafts of metal, etc.

Use the same objects above or obtain others and measure them with a ruler.